

A Preliminary Study on the Identification of the Littoral Oligochaete (Annelida) and Chironomidae (Diptera) Fauna of Lake Kovada, a National Park in Turkey

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Abstract: Samples were collected from 7 different stations between January 2002 and December 2002 with a view to identifying the littoral benthic fauna (Oligochaeta and Chironomidae) of Lake Kovada, located in Southern Anatolia. As a result of this study, 35 species were determined, comprising 15 species from Oligochaeta (8 Naidid and 7 Tubificid), and 20 species from Chironomidae (4 Tanypodin, 2 Orthocladin, 12 Chironomini and 2 Tanytarsin). Species richness varied between 11 and 19. The littoral Oligochaeta and Chironomidae fauna of Lake Kovada was dominated by the widely distributed *Potamothenix hammoniensis*, *Tubifex tubifex*, *Limnodrilus hoffmeisteri* and *Nais communis* (Oligochaeta), and *Cryptochironomus defectus* and *Chironomus (Chironomus) riparus* (Chironomidae).

Of all the oligochaetes inhabiting the channel between Lake Kovada and Lake Eğirdir (seventh station), *Ophidonais serpentina* and *Stylaria lacustris* were the most abundant species, accompanied by *Limnodrilus hoffmeisteri* and some unidentified Enchytraeidae species. As for chironomids, the most abundant species were *Chironomus (Chironomus) riparus*.

Key Words: Oligochaeta, Chironomidae, littoral fauna, Lake Kovada, Turkey.

Türkiye Doğal Parklarından biri olan Kovada Gölü Litoral Bentik Oligochaeta (Annelida) ve Chironomidae (Diptera) Faunasının Belirlenmesine Yönelik Ön Çalışmalar

Özet: Güney Anadolu'da yer alan, Kovada Gölü litoral bentik (Oligochaeta ve Chironomidae) faunasının belirlenmesi amacı ile, Ocak 2002-Aralık 2002 tarihleri arasında 7 istasyondan örnekler toplanmıştır. Çalışma sonucunda 15'i Oligochaeta (sekiz Naidid ve yedi Tubificid) ve 20'si Chironomidae (dört Tanypodin, iki Orthocladin, oniki Chironomini and iki Tanytarsin) türü olmak üzere toplam 35 tür tespit edilmiştir. Tür zenginliği 11 ile 19 tür arasında değişmektedir. Kovada Gölü litoral Oligochaeta ve Chironomidae faunasında geniş dağılım gösteren ve dominant olan türler, *Potamothenix hammoniensis*, *Tubifex tubifex*, *Limnodrilus hoffmeisteri* ve *Nais communis* (Oligochaeta); *Cryptochironomus defectus*, *Chironomus (Chironomus) riparus* (Chironomidae) dir.

Kovada Gölü ile Eğirdir Gölü arasındaki kanalda ise (7. istasyon) *Ophidonais serpentina*, *Stylaria lacustris*, *Limnodrilus hoffmeisteri* (Oligochaeta) ve tür seviyesine kadar tespit edilemeyen Enchytraeidae ile *Chironomus (Chironomus) riparus* (Chironomidae) en çok rastlanılan türlerdir.

Anahtar Sözcükler: Oligochaeta, Chironomidae, litoral fauna, Kovada Gölü, Türkiye.

Introduction

Turkey has a remarkable biodiversity due to its geographical and climatic status (Ustaoğlu et al., 2003), enjoying some of the most important areas in terms of national parks, natural lakes and wetlands in the Palearctic, as has been shown by the recent list of the Important Bird Areas (IBAs) of Turkey (Magnin and Yazar, 1997). Oligochaetes, a subclass of the class

Clitellata, and chironomids, a family of the Diptera, both have a worldwide distribution. Both of these groups have species with an ability to adapt to every kind of body of water, such as brackish water, fresh water or salt water. In the muddy bottoms of lakes, oligochaete is generally one of the dominant components of the macrobenthos, as is chironomid larvae. Not only are oligochaete and chironomid used in biodiversity studies, pollution surveys

and environmental assessments, but also they are of economic importance (Mason, 1996; Wetzel et al., 2000). Few studies have been carried out to identify Oligochaeta and Chironomidae species in Lake Kovada. Kardeşin (1998) determined 3 Oligochaeta and 12 Chironomidae taxa, Yıldız (2003) determined 10 Oligochaeta species and Taşdemir (2003) determined 9 Chironomidae species in Lake Kovada or in the channel between Lakes Kovada and Eğirdir. As none of these studies have been published due to being either MSc or PhD theses, the names of the species given in these studies have not been mentioned in our study. Kazancı et al. (1999) did not report any names for the species of Oligochaeta and Chironomidae in their study entitled "Lakes in Turkey", which also includes Lake Kovada.

Lake Kovada is one of the important national parks in Turkey. Our study aims to investigate the littoral species composition and distribution of the species of Oligochaeta and Chironomidae.

Materials and Methods

Lake Kovada, a continuation of Lake Eğirdir to the south, was formed through the blocking of the narrow valley over a long time. Lake Kovada, lying to the east of Isparta and to the south of Lake Eğirdir, is the result of the overflowing of Lake Eğirdir. There are known to be Karstic patterns between both of these lakes, as well as all around Lake Kovada. The deepest part of the lake is about 7 m. It is located at an altitude of 900 m and has a 40 km² surface area. The length of the lake is roughly 9 km and the average width is about 2-3 km (Magnin et al., 2000).

Our samples were collected during spring (May), summer (August) and autumn (October) 2002 to identify the littoral Oligochaeta and Chironomidae fauna of the Lake Kovada. The 7 sampling stations in our study were selected at random, 1 of which is the channel between Lake Eğirdir and Lake Kovada (Figure). The coordinates and the depth of the stations in Lake Kovada are presented in Table 1.

The samples were fixed with 10% formaldehyde after they were sieved several times in the field, brought to the lab, sorted out and then transferred to 70% ethyl alcohol. All the samples were identified to genera-species level where possible (with the exception of immature or damaged Oligochaeta and Enchytraeidae). For

Oligochaeta, the identification was based on Sperber (1948), Brinkhurst and Jamieson (1971) and Timm (1999), and for Chironomidae on keys provided by Epler (1995) Cranston (1982), Pillot (1984) and Şahin (1991).

Results and Discussion

This study was carried out to identify the littoral oligochaeta and chironomidae fauna of Lake Kovada. Our study identified 35 species altogether, comprising 15 species from Oligochaeta, and 20 species from Chironomidae from 7 stations. Among the oligochaetes collected, there were many immature individuals that could not be identified (including Enchytraeids), and thus they were excluded from this study.

The distribution of the littoral Oligochaeta and Chironomidae species in relation to the stations in Lake Kovada is presented in Table 2. Species richness varied between 11 and 19 in the study area. The highest species number was found at Station 1 while the lowest taxa were found in Station 5 (Table 2).

At the sampling sites in Lake Kovada (sites 1-6; Figure), *Potamothrix hammoniensis*, *Tubifex tubifex*, *Limnodrilus hoffmeisteri*, *Nais communis* (Oligochaeta), *Cryptochironomus defectus* and *Chironomus (Chironomus) riparus* (Chironomidae) were the most abundant species in the littoral zone of the lake, while *Ophidonais serpentina*, *Stylaria lacustris*, *Limnodrilus hoffmeisteri* and *Chironomus (Chironomus) riparus* were the most abundant species in the channel. *Cricotopus (C.) annulator*, *Eukiefferiella* sp. and *Paratanytarsus lauterborni* were found in only one station in the study area (Station 7).

As can be seen in Table 2, the littoral oligochaeta fauna of Lake Kovada consists of tubificine and naidine tubificids [the former family Naididae is treated here as a subfamily of Tubificidae, following Erséus et al., 2002]. Based on sequences of 18S rDNA and other molecular and morphological data it was concluded that the family Naididae is polyphyletic, and that the species of naidids are more correctly placed within a subfamily of the Tubificidae (Erséus et al., 2002). Therefore, Naididae has become a junior synonym of the family Tubificidae, as the name Naididae is older than Tubificidae, and Erséus and Gustavsson propose that Tubificidae take precedence because of the large number of species in the tubificids

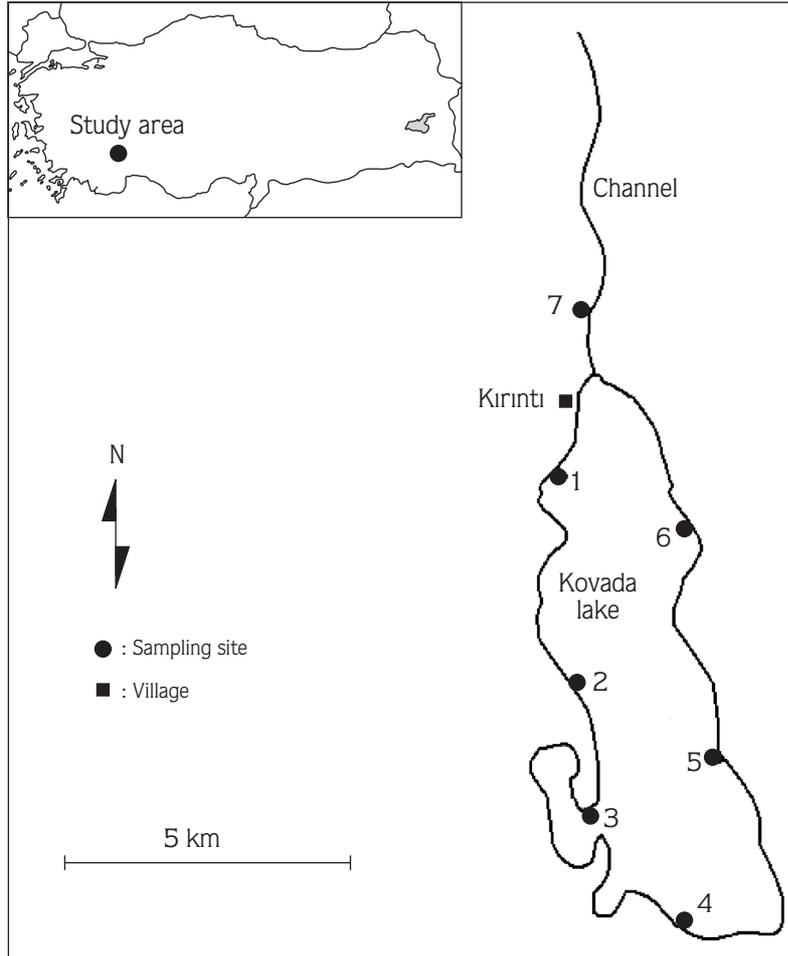


Figure. Geographical situation of the Lake Kovada National Park and sampling stations.

Table 1. Coordinate and depth of the stations in the Lake Kovada and channel (ch: channel).

Stations	Depth (cm)	Coordinate
1	70	39° 00' 00 N - 035° 00' 00 E
2	110	37° 37' 57 N - 030° 52' 25 E
3	90	37° 37' 46 N - 030° 52' 18 E
4	85	37° 37' 34 N - 030° 52' 24 E
5	50	37° 36' 48 N - 030° 53' 55 E
6	100	37° 39' 23 N - 030° 52' 48 E
7 (ch)	40	37° 39' 23 N - 030° 52' 18 E

compared with the Naididae (Erséus and Gustavsson, 2002; Erséus et al., 2002). Timm (1980) indicated that the Tubificidae members and naidin species are distributed everywhere but they surely originate from the northern temperate zone. Wetzel et al. (2000) indicated that the family Tubificidae and several of its genera (e.g., *Limnodrilus* and *Tubifex*) are considered cosmopolitan; other genera (e.g., *Potamothrix*, *Rhycodrilus*) are widely distributed throughout the world. In the present study, 7 Tubificid species were identified in the littoral zone of the lake and 3 of them, *Potamothrix hammoniensis*, *Tubifex tubifex* and *Limnodrilus hoffmeisteri*, were the most abundant species in the study area. Our findings seem to be in agreement with this knowledge. One of the samples belonging to the family Tubificidae (*Tubifex* sp.) could not be identified to species level. Our *Tubifex* sp. samples had

Table 2. Distribution of Oligochaeta and Chironomidae taxa regarding the stations in Lake Kovada National Park and channel in 2002.

Taxa		Stations						
Oligochaeta								
Tubificidae		1	2	3	4	5	6	7
1	<i>Tubifex tubifex</i> (Müller, 1774)	+			+	+		+
2	<i>Tubifex</i> sp.	+	+			+		
3	<i>Limnodrilus hoffmeisteri</i> Claparède, 1862	+	+		+	+	+	+
4	<i>Limnodrilus udekemianus</i> Claparède, 1862		+	+			+	+
5	<i>Psammoryctides albicola</i> (Michaelsen, 1901)	+						+
6	<i>Potamothrix hammoniensis</i> (Michaelsen, 1901)	+		+		+	+	+
7	<i>Potamothrix bavaricus</i> (Oschmann, 1913)	+		+				
Naidinae								
8	<i>Nais barbata</i> Müller, 1773	+		+			+	
9	<i>Nais communis</i> Piguët, 1906	+	+	+		+	+	+
10	<i>Nais pardalis</i> Piguët, 1906		+		+			+
11	<i>Stylaria lacustris</i> (Linnaeus, 1767)	+	+			+	+	+
12	<i>Dero digitata</i> (Müller, 1773)		+	+				
13	<i>Pristinella jenkiniae</i> (Stephenson, 1931)	+			+	+		
14	<i>Ophidonais serpentina</i> (Müller, 1773)	+		+			+	+
15	<i>Paranais frici</i> Hrabě, 1941		+		+		+	
Chironomidae								
Tanypodinae								
16	<i>Tanypus</i> sp.		+	+	+			
17	<i>Ablabesmyia phatta</i> (Egger, 1863)		+		+	+		
18	<i>Procladius (Psilotanypus)</i> sp.		+				+	
19	<i>Procladius (Holotanypus)</i> sp.	+			+			
Orthoclaadiinae								
20	<i>Cricotopus (C.) annulator</i> Goetghebuer, 1927							+
21	<i>Eukiefferiella</i> sp.					+		
Chironominae								
22	<i>Cryptochironomus defectus</i> (Kieffer, 1913)	+	+				+	+
23	<i>Chironomus (C.) riparus</i> K., 1911		+	+	+			+
24	<i>Chironomus anthracinus</i> Zetterstedt, 1860	+		+				
25	<i>Chironomus tentans</i> Fabricius, 1805		+	+				
26	<i>Chironomus viridicollis</i> V., 1877	+						+
27	<i>Polypedilum gr. sordens</i>	+						+
28	<i>Polypedilum (Pentapedilum) sordens</i> (vdW, 1874)	+						
28	<i>Polypedilum (Polypedilum) nubifer</i> (Skuse, 1899)		+		+	+		
30	<i>Polypedilum (Tripodura) scalaeneum</i> (Schränk, 1803)				+	+	+	
31	<i>Polypedilum (Pentapedilum) exsectum</i> (Kieffer, 1916)	+		+				
32	<i>Dicrotendipes tritonus</i> (Kieffer, 1916)		+					+
33	<i>Parachironomus arcuatus</i> Goetghebuer 1919	+				+		
34	<i>Rheotanytarsus exiguus</i> Joh., 1937				+			+
35	<i>Paratanytarsus lauterborni</i> (Kieffer, 1909)							+

sparse hair chaeta and few pectinate chaetae, and these samples were very similar to *Tubifex tubifex f. bergi* described by Chapman and Brinkhurst (1987). This sample was recorded as *Tubifex* sp. because it had not matured.

Tubifex tubifex is known to be a typical species of organic polluted water. In addition, *Limnodrilus hoffmeisteri* is found in large numbers in densely polluted waters (Brinkhurst and Jamieson, 1971; Mason, 1996) and *Potamothenix hammoniensis* is a reliable indicator of eutrophy or local organic enrichment when occurring in considerable densities (Milbrink, 1980).

Most naudin are cosmopolitan and occur across the world. They inhabit the water column, submerged vegetation, and sediments, and can be fairly active swimmers (Wetzel et al., 2000). The naudin, *Nais communis*, was the most abundant species in the littoral area among the aquatic vegetation while *Ophidonais serpentina* and *Stylaria lacustris* were the most abundant species in the channel between Lake Kovada and Lake Eğirdir. Our findings seem to comply with this knowledge.

Twenty Chironomidae species were determined from the study site; 2 of them, *Cryptochironomus defectus* and

Chironomus (Chironomus) riparus, were the most abundant species in the littoral zone of the lake. However, *Cricotopus (C.) annulator*, *Eukiefferiella* sp. and *Paratanytarsus lauterborni* were found at one station only in the study area.

There is known to be a correlation between ecological demands and distributions of Chironomidae and Oligochaeta species and they are sources of nutrients for each other (Darby, 1962). In our research area, where members of Chironomidae (especially members of Tanypodinae) are densely distributed, it was observed that the variation of oligochaete species decreased. At Station 4, the number of tanypodin samples, especially *Tanypus* sp., *Procladius (Holotanypus)* sp., and partly *Ablabesmyia phatta*, was higher than that of oligochaeta.

In the study area, *Chironomus (Chironomus) riparus*, *Cryptochironomus defectus*, *Tubifex tubifex*, and *Limnodrilus hoffmeisteri* species were the most abundant. These species are known to occur mostly in polluted waters (Brinkhurst and Jamieson, 1971; Mason, 1996). The pollution of the Lake Kovada could be characterized by the species *Chironomus (Chironomus) riparus*, *Cryptochironomus defectus*, *Tubifex tubifex* and *Potamothenix hammoniensis*.

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