E.Ü. Su Ürünleri Dergisi 2010
E.U. Journal of Fisheries & Aquatic Sciences 2010
Cilt/Volume 27, Sayı/Issue 2: 61-64

ISSN 1300 - 1590
http://jfas.ege.edu.tr/

The Chironomidae (Diptera-Insecta) Fauna of Yuvarlakçay Stream (Köyceğiz-Muğla-Turkey)

*Ayşe Taşdemir, Mustafa Ruşen Ustaoğlu, Süleyman Balık

Ege University, Fisheries Faculty, Department of Hydrobiology
35100, Bornova, İzmir, Turkey
**E mail: ayse.tasdemir@ege.edu.tr*

Özet: ***Yuvarlakçay'ın (Köyceğiz-Muğla-Türkiye) Chironomidae (Diptera-Insecta) Faunası.*** Türkiye'nin güneybatısında Köyceğiz-Dalyan özel koruma bölgesinde bulunan Yuvarlakçay'ın Chironomidae faunasını belirlemek amacıyla, Mayıs 2001-Nisan 2002 tarihleri arasında aylık olarak 8 istasyondan örnekleme yapılmıştır. Örnekler 180 µ ve 500 µ göz açıklığına sahip el kepçeleri ve 7. ve 8. istasyonlarda da Ekman-Birge grab kullanılarak toplanmıştır. Çalışmanın sonucunda Chironominae'den 18 takson, Orthocladiinae'den 12 takson ve Tanypodinae'den 5 takson olmak üzere toplam 35 takson tespit edilmiştir.

Anahtar Kelimeler: Chironomidae, Fauna, Yuvarlakçay, Muğla, Türkiye.

Abstract: To detect the distribution of Chironomidae fauna of Yuvarlakçay Stream in the Köyceğiz-Dalyan protected area in South-Western Turkey, monthly samplings were made from 8 stations from May 2001 to April 2002.The samples were collected by using 180 µ and 500 µ mesh size hand nets and an Ekman-Birge Grab in 7th and 8th stations. As a result of the study, totally 35 taxa comprised of 18 taxa from Chironominae, 12 taxa from Orthocladiinae and 5 taxa from Tanypodinae were determined.

Key Words: Chironomidae, Fauna, Yuvarlakçay Stream, Muğla, Turkey.

Introduction

Larval period of Chironomidae is the longest period of life cycle of these insects. Chironomidae larvae are quite important in production of benthic biomass and they can be found in many different environments because of their ability to adapt to extremes of some physicochemical composition of water. Chironomids are excellent indicators of water quality (Rosenberg and Resh, 1993). Under certain conditions, such as low level of dissolved oxygen, larval chironomids may be the only insect present in benthic sediments (Armitage et al., 1995).

Yuvarlakçay Stream, which is one of the most important flowing waters joining to Köyceğiz Lake, has both economic and ecological significance. For example, besides tourism activities, having with the Turkey's biggest trout farm indicates its economic significance for the region (Yıldız et al., 2007).

Irregular flow regime, which is observed in most of the rivers in our country is not observed in Yuvarlakçay Stream. Ecological diversity is remarkable because of continuous water flow during annual period. Drainage area of the river is under anthropogenic influence from settlement and industrial plants located in its basin .

Yuvarlakçay Stream has a relatively small catchment area in southwestern part of Anatolia, Turkey and belongs to the Köyceğiz-Dalyan Special Protected Area. However, most (if not all) of the drainage area is under anthropogenic influence from settlement nearby its environs. The stream has so far been attractive to native scientists especially for the last decade. Several works carried out to determine the macro-invertebrate communities and environmental characteristics of the stream (Barlas et al, 2000; Kazancı and Dügel, 2000; Ustaoğlu et al, 2003; Özbek et al, 2003; Özbek et al, 2004; Yıldız et al, 2007).

Up to date, there was no detailed study concerning the Chironomidae fauna of Yuvarlakçay Stream. The objective of the present study was to examine the Chironomidae fauna and distribution pattern of Chironomidae in this stream.

Material and Methods

Yuvarlakçay Stream with about 15 km of length is fed by a main spring located at ca. 4 km NW of Beyobası Village, Muğla. The stream is placed in Köyceğiz-Dalyan Special Protected Area and is an important freshwater source for Köyceğiz Lagoon (also known Lake Köyceğiz), SW Anatolia, Turkey. The lagoon has about 56 km^2 of surface area and is mainly feed by the streams such as Namnam and Kargacık in addition to Yuvarlakçay Stream (Figure 1; Table 1).

The study was carried out in monthly intervals from May 2001 to April 2002 completing about 12 months (at 8 stations). At each sampling site in the stream, kick-net samples of chironomids collected with a hand net (frame 50 x 30 cm, mesh size 500 μm) by means of disturbing the substrate from an area covering almost 1m^2 in addition to an Ekman Birge grab at the seventh and eighth stations.

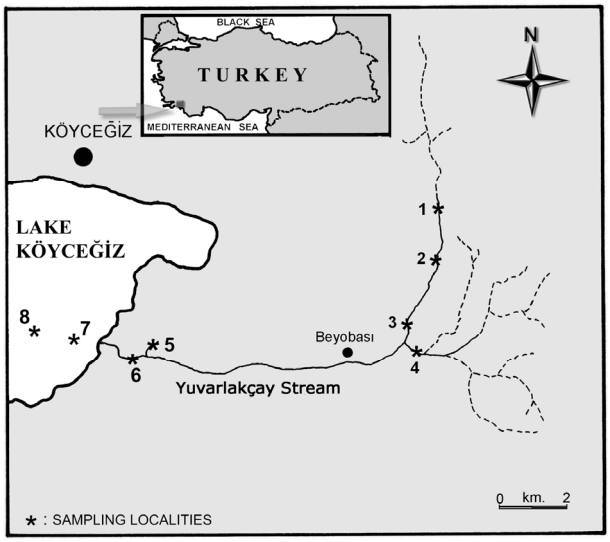

Figure 1. Study area and sampling stations.

Table 1. Sampling stations and their coordinates.

Stat. No	Locality	Coordinates
1	Source of Yuvarlakçay Stream	36° 56' 50" N 28° 48' 37" E
2	Before Trout Farm	36° 56' 19" N 28° 48' 37" E
3	After Trout Farm	36° 54' 48" N 28° 47' 53" E
4	Karaboğsak Stream	36° 54' 39" N 28° 47' 47" E
5	Nasıf Dede Stream	36° 54' 34" N 28° 42' 18" E
6	After Nasıf Dede Stream + River Mouth	36° 54' 39" N 28° 41' 31" E
7	Lake Köyceğiz + Beyond the River Mouth	36° 54' 36" N 28° 41' 18" E
8	Lake Köyceğiz	36° 54' 38" N 28° 41' 07" E

The samples were fixed in 4 % formaldehyde solution in the field. Later they were preserved in 70 % alcohol until identification to species level after washing in the laboratory. After the permanent preparation of sorted chironomidae specimens with Euparal, larvae were identified using a stereomicroscope and a binocular microscope. The reference materials are being kept in the collection of the author as permanent whole mount.

For taxonomical identification of the specimens, Hirvenoja (1973), Wiederholm (1983), Cranston (1982), Fittkau and Roback (1983) and Klink and Moller Pillot (2003) were used.

Results

As a result of the study 35 taxa were determined. Taxonomic positions and distributions of the determined taxa according to the stations are given in Table 2.

Chironominae subfamily has the maximum taxa (18 taxa) and followed by Orthocladiinae subfamily (12 taxa). When the determined taxa were investigated by their presence at the stations, *P.* (*T.*) *scalaenum* (at 5 stations), *P.* (*U.*) *convictum* (at 4 stations) and *Conchapelopia* sp.(at 4 stations) were the most frequent taxa. They were followed by *A.* (*A.*) *monilis*, *P.* (*H.*) sp., *P. rufiventris*, *C.* (*C.*) *anthracinus*, *Micropsectra* sp. and *Tanytarsus* sp., which were found at three stations.

Table 2. Distribution of the taxa belonging to Chironomidae in the stations.

Taxa	Stations
Tanypodinae	
Ablabesmyia (Ablabesmyia) longistyla Fittkau 1962	5
Ablabesmyia (A.) monilis (Linnaeus, 1758)	1, 5, 6
Conchapelopia sp.	2, 3, 5, 6
Procladius (Holotanypus) sp.	4, 5, 6
Procladius (Psilotanypus) sp.	5, 6
Orthocladiinae	
Brillia modesta (Meigen,1830)	2
Cricotopus sp.	6
Cricotopus (Isocladius) sylvestris (Fabricius 1794)	5, 6
Cricotopus (Cricotopus) tremulus (Linnaeus, 1758)	1
Cricotopus (C.) trifascia Edwards, 1929	4
Cricotopus (C.) viereriensis Goetghebuer 1935	1,3
Eukiefferiella ilkleyensis (Edwards, 1929)	3
Parametriocnemus stylatus (Spärck 1923)	6
Paratrichocladius rufiventris (Meigen, 1830)	1,3,6
Psectrocladius (P.) sordidellus (Zetterstedt 1838)	1
Rheocricotopus (R.) fuscipes (Kieffer, 1909)	3,6
Orthocladius sp.	1,6
Chironominae	
Chironomus (C.) anthracinus Zetterstedt, 1860	3,7,8
Chironomus (C.) plumosus (Linnaeus, 1758)	7,8
Chironomus (C.) riparius (Kieffer, 1911)	3
Chironomus (C.) salinarius Kieffer 1915	7,8
Chironomus viridicollis (Wulp, 1858)	7,8
Chironomus (C.) tentans Fabricius,1805	7
Cryptochironomus defectus (Kieffer 1913)	5,6
Endochironomus sp.	3,6
Paratendipes albimanus (Meigen 1818)	5,6
Phaenopsectra sp.	3,6
Polypedilum (U.) convictum (Walker 1856)	2,3,4,6
Polypedilum (T.) scalaenum (Schrank, 1803)	3,5,6,7,8
Microchironomus tener (Kieffer 1918)	2,8
Microtendipes pedellus (De Geer 1776)	6
Paratanytarsus sp.	5,6
Micropsectra sp.	1,3,6
Rheotanytarsus sp.	3
Tanytarsus sp.	4,5,6

When the stations were taken into consideration separately, the sixth station was the richest one with 20 taxa and followed by the third station with 13 taxa. The second and the fourth stations were the poorest ones with four taxa.

Discussion

Whereas the chironomid fauna of upland streams is generally dominated by Orthocladiinae and other taxa adapted to cool, well-oxygenated situations, the dominant chironomid

subfamily in potamal communities is Chironominae. In the main, species of this subfamily are adapted to living in soft sediments and are better able to tolerate the higher temperatures and sometimes lower oxygen concentrations that occur in large lowland rivers. However, where there are faster flowing riffles with a more stable substratum, or where there is aquatic vegetation, Orthocladiinae and other taxa more characteristic of the rhithron may thrive (Armitage, 1995).

As stated earlier, the Chironomidae family contains species which are very important in the determination of water quality. An evaluation of these species and the stations at which they are found is as follows;

Since the first and second stations are the sections of the river where it has its source, they appear cleaner than the other stations. Also, as a result of the study by Kazancı and Dügel (2000), both of these stations were found to belong to the slightly polluted or non-polluted group according to their biotic index values. The typical indicator species *Brillia modesta* (oligo-saprobic), which shows no tolerance to pollution, and *Ablabesmyia (Ablabesmyia) monilis* (Beta-mesosaprobic) which occurs in slightly polluted waters, are present in these localities. It is also of note that in both localities water flow is an important factor and has a limiting effect on the distribution of other species. For this reason, taxa belonging to the Tanypodinae and Orthocladiinae sub-families are found in greater numbers at these localities.

The third station, which is the second richest station from the point of view of taxon numbers, is included in the slightly polluted water class in previous studies, having class II water quality values according to the Belgian biotic index (Kazancı and Dügel, 2000). We may attribute this to the fact that it is the station which comes directly after the trout farm. When analyzed with regard to the chironomid species found, it contains the species *Chironomus* (*Chironomus*) *anthracinus* (Oligosaprobic), *Chironomus riparius* (Alpha-mesosaprobic), and *Polypedilum* (*Tripodura*) *scalaenum* (Alpha-mesosaprobic), which are tolerant to pollution.

The fourth station, which is a brook whose water mingles with the Yuvarlakçay stream (Karaboğsak brook), is one of the poorest stations from the point of view of taxon numbers and has class IV water quality. The chironomid species include the taxa *Procladius* (*Holotanypus*) sp., which has a wide distribution, *Cricotopus (Cricotopus) trifascia,* which generally has river and stream forms, *Polypedilum* (*Uresipedilum*) *convictum* and *Tanytarsus* sp.

Like the previous station, the 5 th station is a brook which mingles with the Yuvarlakçay stream (Nasıfdede brook) and it has been reported as having water quality ranked as class II (slightly polluted) and class IV (heavily polluted) (Kazancı and Dügel, 2000). The pollution observed here is thought to be the result of agricultural activities. This station generally contains taxa suited to its habitats and comprises the species *Ablabesmyia monilis*, which is reported as being found in beta-meso saprobic waters, *Paratendipes albimanus*, which is found in oligo-saprobic waters, and *Polypedilum* (*Tripodura*) *scalaenum*, which occurs in Alpha-meso-saprobic waters (Rosenberg and Resh, 1993).

The 6 th station is the richest station located in the lower sections of the stream. In this region a comparative increase in salinity values is observed. One of the basic reasons for this situation is the fact that it is in a state of interaction with the lake by means of underground waters. In the study by Kazancı and Dügel, a total of 20 taxa were detected in the water, which was designated as class II (slightly polluted) and class III (moderately polluted critical situation), 10 of these taxa belonging to the sub-family Chironominae, 6 to the sub-family Orthocladiinae and 4 to the sub-family Tanypodinae.

According to the project report, the 7 th and 8 th stations, selected from within Köyceğiz lake, are reported as having water of class IV quality and mesohaline b character from the point of view of salinity values. The chironomidae species detected at both of these stations were similar, comprising both species tolerant to salinity (*C.* (*C.*) *salinarius*) and to organic pollution (*C.* (*C.*) *anthracinus, C.* (*C.*) *plumosus, C.* (*C.*) *tentans*). According to Rosenberg and Resh, 1993, *Chironomus* (*Chironomus*) *anthracinus* is reported as occurring in Oligo-saprobic, *C.* (*C.*) *plumosus* in Alpha-meso-saprobic and Poly-saprobic, *C.* (*C.*) *tentans* in Oligo-saprobic and Poly-saprobic, and , *Polypedilum* (*Tripodura*) *scalaenum* in Alpha-meso-saprobic waters.

With this study we have aimed to make a contribution regarding the chironomidae fauna of the Yuvarlakçay stream and the river mouth region where it flows into the sea, this being a habitat of considerable importance from an economic and ecological viewpoint. The establishment of the entire faunal composition of this environment will enable sounder and more definitive results to be obtained in follow-up studies.

Acknowledgements

The authors are grateful to Associate Professor Dr. Hasan M. Sari, Research Assistant Dr. Cem Aygen, Research Assistant Ali İlhan and Research Assistant Esat T. Topkara for fieldwork assistance. For reviewing the manuscript, we are also indebted to Associate Professor Dr. Murat Özbek.

References

Armitage, P., P. S. Cranston, L. C. V. Pinder. 1995**.** The Chironomidae. The biology and ecology of non-biting midges. Chapman and Hall, London , pp 1-572.

Barlas, M., F. Yılmaz, Ö. İmamoğlu and Ö. Akkoyun. 2000. Physico-Chemical and Biological investigation of Yuvarlak Stream within the Köyceğiz district of Muğla, Su Ürünleri Semp., 20-22 Eylül 2000, Sinop, 249-265 (in Turkish).

Cranston, P. S., 1982. A Key to The Larvae of The British Orthocladiinae (Chironomidae). Freshwater Biological Association Scientific Publication No. 45: 1-152.

Fittkau, E. J. and S. S. Roback, 1983. The larvae of Tanypodinae (Diptera: Chironomidae) of the Holoarctic region- Keys and diagnoses. Entomologica Scandinavica, Suppl. 19: 33- 110.

Hirvenoja, M. 1973. Revision der Gattung Cricotopus van der Wulp und ihrer Verwandten (Diptera, Chironomidae)Ann. Zool. Fennici 10: 1-363.

Kazancı, N. and M. Dügel, 2000. An Evaluation of the Water Quality of Yuvarlakçay Stream, in the Köyceğiz-Dalyan Protected Area, SW Turkey, Turkish Journal of Zoology 24: 69-80.

Klink, A.G. and H.K.M. Moller Pillot. 2003. Chironomidae larvae. Key to the Higher Taxa and Species of the Lowlands of Northwestern Europe. World Biodiversity Database, CD-ROM Series. Expert Center for Taxonomic Identification, University of Amsterdam.

Özbek, M., M.R. Ustaoğlu and S. Balık. 2003. Contribution to the Knowledge on Variability and Ecology of *Echinogammarus antalyae* G. Karaman 1971 (Crustacea: Amphipoda: Gammaridae), Zoology in the Middle East, 29: 113-115.

Özbek, M., S. Balık and M. R. Ustaoğlu. 2004. Malacostraca (Crustacea) Fauna of Yuvarlakçay Stream (Köyceğiz- Muğla). Turkish Journal of Zoology, 28:321-327.

Rosenberg, D. M. and V. H. Resh, 1993. Freshwater biomonitoring and benthic macroinvertebrates, Chapman and Hall, New York, 1-488.

Ustaoğlu, M. R., S. Balık and M. Özbek. 2003. The Mollusca Fauna of Yuvarlak Stream (Köyceğiz- Muğla). E. Ü. Su Ürünleri Dergisi, 20(3-4): 433-438 (in Turkish).

Wiederholm, T., 1983. Chironomidae of the Holarctic region. Keys and diagnoses. Part I. Larvae. Entomologica Scandinavica, 19, 1-457.

Yıldız,S., M.R. Ustaoğlu and S. Balık. 2007**.** The Oligochaeta (Annelida) Fauna of Yuvarlak Stream (Köyceğiz-Turkey)). Turkish Journal of Fisheries and Aquatic Sciences 7: 01-06.