

Seasonal Changes in Chironomids (Diptera:Chironomidae) of Kesikköprü Dam Lake (Ankara, Turkey)

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ABSTRACT

The seasonal variations of species belonging to the family Chironomidae along with some physical and chemical properties of Kesikköprü (Ankara) dam lake during the period of April 1995- May 1996 were investigated. Chironomid larvae were composed of 26 % of benthic fauna. Ten species of Chironomids were recorded from dam lake. Also, temperature of lake water and weather, pH, oxygen, light permeability and depth were measured monthly. Results showed that the Kesikköprü dam lake is oligotrophic.

INTRODUCTION

Benthic organisms have an importance role in food turnover in the lakes; and determine the biological fertility of a lake, and with feeding of fishes (Brundin, 1949; Thienemann, 1954; Brinkhurst, 1974; Fittkau, 1978).

Chironomids are assumed as indicators of trophication, water quality, pollution, major ecological structure and changes of lakes (Brundin, 1949; Thienemann, 1954; Wilhm, 1975; James, 1979; Fittkau and Reiss, 1986).

There are about 200 natural and 120 dam lakes in Turkey. These lakes have different dimensions and ecological conditions. Works on Chironomids in the lakes in Turkey increase recently (Geldiay, 1949; Şahin and Baysal, 1972; Geldiay and Tareen, 1972; Tanyolaç and Karabatak, 1974; Kırgız and Soylu, 1975; Ustaoglu, 1980; Şahin, 1980, 1984, 1986, 1987a, 1987b, 1987c, 1987d, 1987e, 1991; Kırgız, 1988, 1989; Şen and Özdemir, 1990; Çetinkaya, 1991; Özdemir and Şen, 1991; Ahıska and Karabatak, 1994; Özkan and Kırgız, 1995; Akıl et al., 1996; Polatdemir and Şahin, 1997).

Many works focused on protein and food value of the larvae of chironomids. These works showed that chironomid larvae are an important food source for fish (Brundin, 1949; Şahin, 1984, 1991).

Kesikköprü dam lake is an importance lake with respect to fishing, water quality and human activities. Up to now, population growth, ecology and biology of fish and zooplanktonic fauna in the Kesikköprü dam lake were investigated (Altındağ et al. 1998, 1999; Yiğit 2001; 2002). But, there is no any work on Chironomidae fauna of this lake.

It was aimed to determine seasonal changes and species of chironomid in Kesikköprü dam lake.

MATERIALS AND METHOD

Kesikköprü dam lake is situated in 100 km south-east of Ankara, with being 650 ha total area 9500 hm³ total volume, 750 altitude and 30 m max. depth, between Kapulukaya and Hirfanlı dam lakes on the Kızılırmak river. Samples were monthly taken from five stations with different depth, in the duration of a year. Also, temperature, pH, O₂, light permeability and sediment structure were recorded. Samples were taken by using Ekman-Birge bottom sampler (15 x 15) from each station two times. Each sample was washed by using 210 µ-3600 µ in diameter (0.21-3.36 mm) sieve series, and then organisms were fixed in 4 % formaldehyde. Samples were examined quality and quantitatively (Lagler, 1956) and identified (Şahin, 1991).

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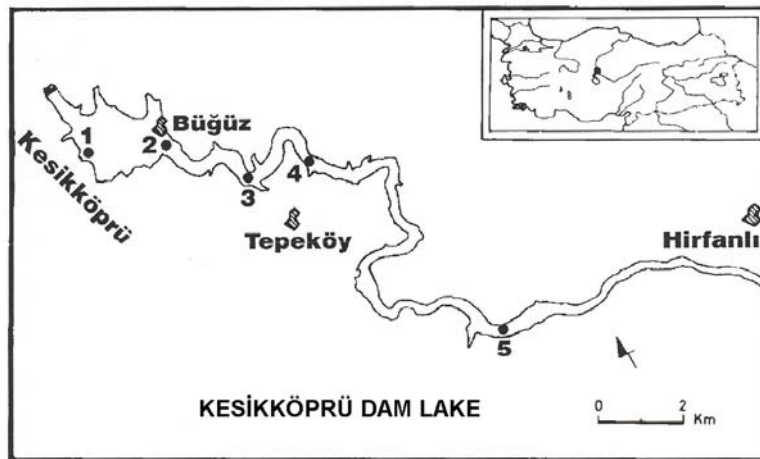


Figure 1. The map showing the stations studied in the Kesikköprü dam lake.

RESULTS

Water temperature is 24 °C in maximum in August, min. 4 °C in January. Oxygen level increased to 12 mg/l in winter based on decreasing in water temperature. It decreased to 8.2 mg/l in summer based on increasing in water temperature. pH varied from 7.2 to 8.6. (8.09 in average). Light permeability changed from 5 to 12 (7.89 in average) (Fig 2).

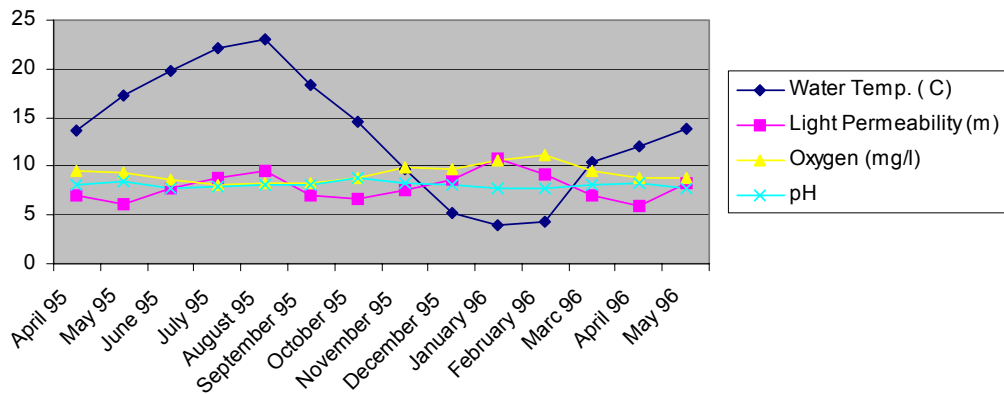


Figure 2. Monthly distribution of Water Temperature, Light Permeability, Oxygen and pH in Kesikköprü Dam Lake.

Ten species belong to the family Chironomidae were recorded from Kesikköprü dam lake. Chironomidae larvae were collected from all stations. Mean values of larvae are 152.74 Idv/m².

Table 1. Species of Chironomidae in the Kesikköprü dam lake.

Class	Family	Species
Insecta	Chironomidae	<i>Chironomus plumosus</i> L.
		<i>Stictochironomus yalvaçii</i> Şahin
		<i>Gillotia alboviridis</i> (Mall.)
		<i>Chironomus reductus</i> Lenz.
		<i>Cryptochironomus defectus</i> Kieffer
		<i>Stictochironomus longipugionis</i> Şahin
		<i>Chironomus anthracinus</i> (Zett.)
		<i>Chironomus (Camptochironomus) tentans</i> Fabr.
		<i>Chironomus thummi</i> Kieffer
		<i>Pentapedilum exsectum</i> Kieffer

Species of Chironomid were not captured from 1. station in April 1995, September 1995 and April 1996, from 2. and 3. station in March 1996 and from 3. station in May 1995, September 1995, October 1995 and February 1996 (Fig. 3). Chironomid larvae reached the highest level of 333.4 idv/m² in June 1995 (Fig. 4).

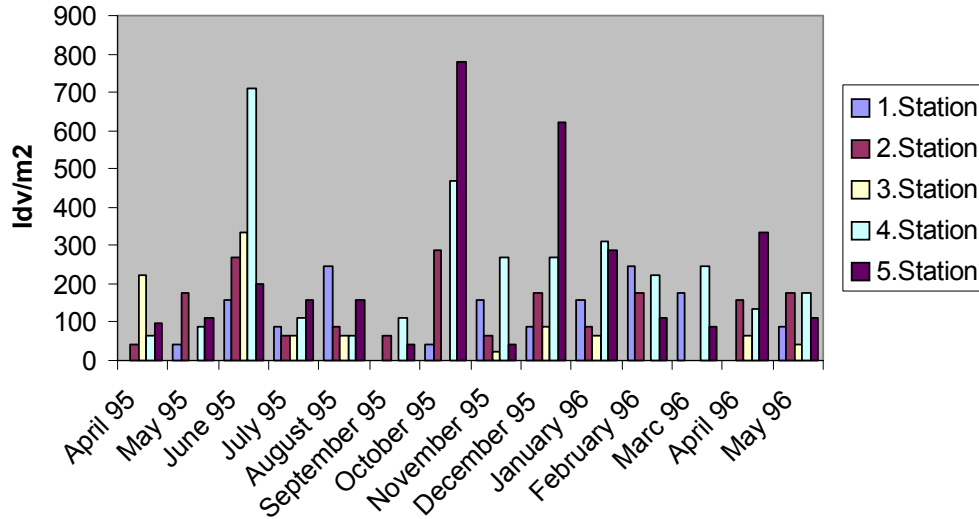


Figure 3. Distribution of chironomids in the Kesikköprü dam lake with respect to stations and months

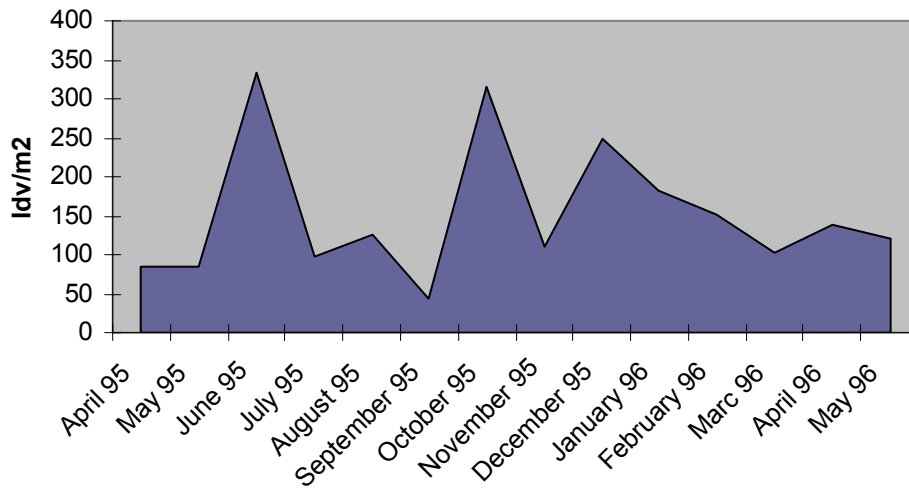


Figure 4. Monthly distribution of chironomids in the Kesikköprü dam lake

The results showed that chironomids picked in June 1995 and October 1995 and that they decreased the minimum level in April 1995, May 1995, September 1995 (Fig. 4).

Abundant, month mean, station mean and lake mean of chironomid species determined in the Kesikköprü dam lake are as follows;

Chironomus plumosus; this species is found to be the most abundant (40.30 %) in the lake. Lake mean of this species is 61.56 idv/m², monthly mean is 307.79 idv/m², and station mean is 861.8 idv/m² (Fig. 5).

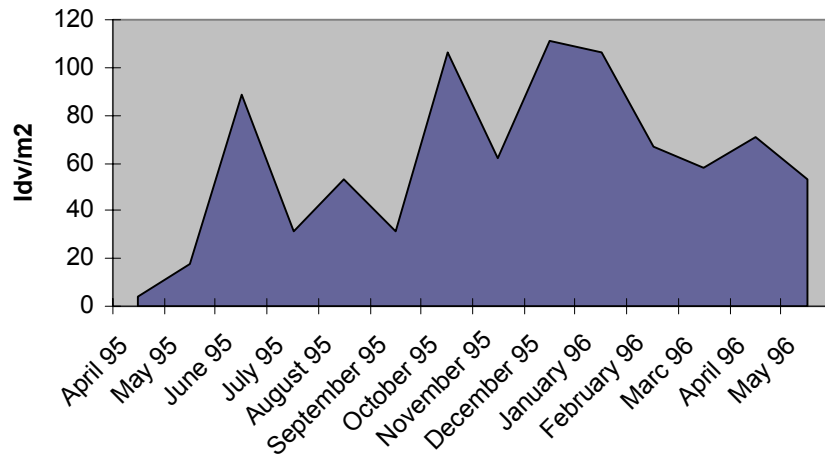


Figure 5. Monthly mean value of *Chironomus plumosus*

Stictochironomus yalvaçii; this species has a ratio of 10.16 % and rare in the stations 1, 2 and 4. Lake mean of this species is 15.52 idv/m², monthly mean is 77.58 idv/m² and station mean is 217.2 idv/m² (Fig. 6).

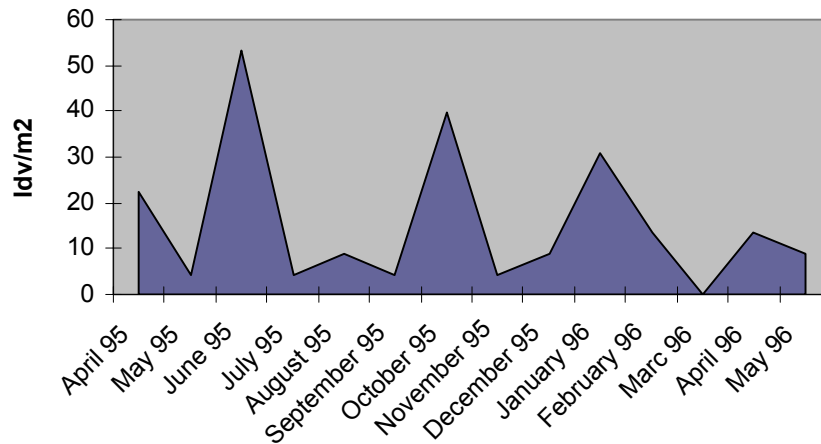


Figure 6. Monthly mean value of *Stictochironomus yalvaçii*

Gillotia alboviridis; this species is composed of 9.32 % of chironomid biomass in the lake. Lake mean of this species is 14.23 idv/m², monthly mean is 71.14 idv/m², and station mean is 199.2 idv/m² (Fig. 7).

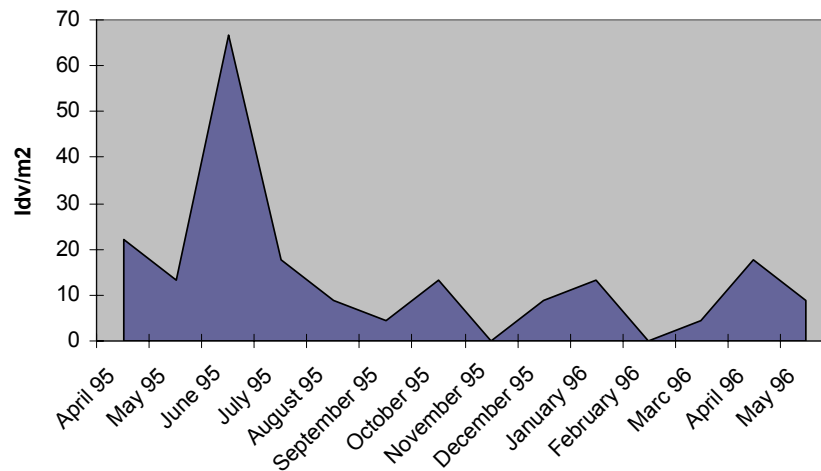


Figure 7. Monthly mean value of *Gillotia alboviridis*

Chironomus reductus; this species is found in a ratio of 8.48 %. Monthly mean of this species is 64.79 idv/m², station mean is 181.4 idv/m², and lake mean is 12.96 idv/m² (Fig. 8).

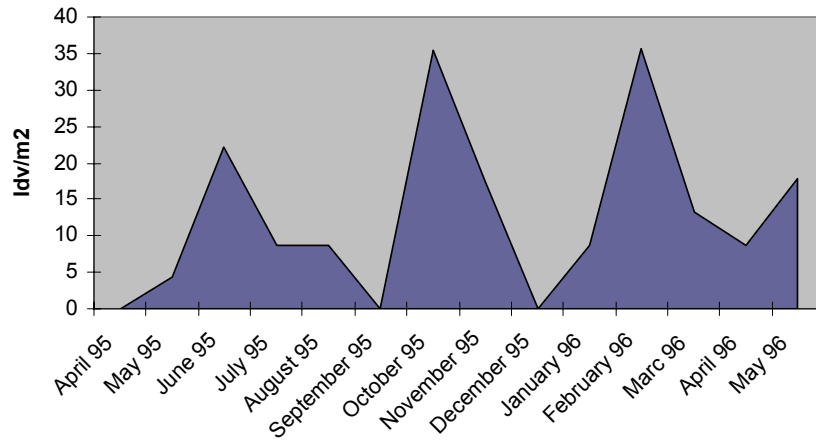


Figure 8. Monthly mean value of *Chironomus reductus*

Cryptochironomus defectus; this species has a ratio of 8.30 % in the lake. Monthly mean of this species is 63.36 idv/m², station mean is 177.4 idv/m², and lake mean is 12.67 idv/m² (Fig. 9).

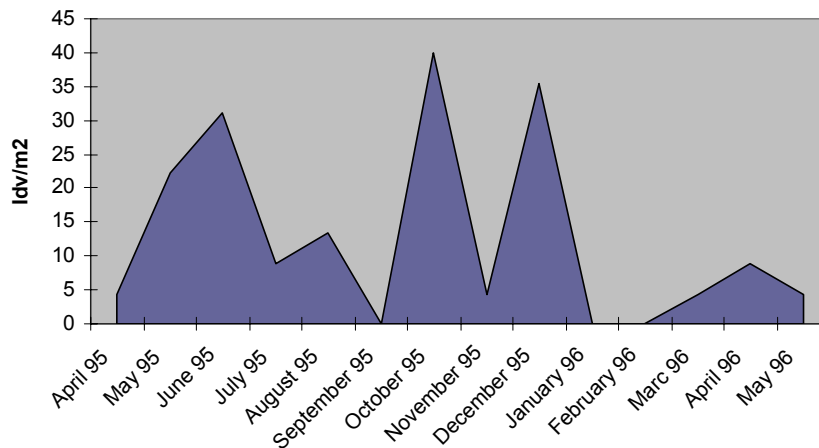


Figure 9. Monthly mean value of *Cryptochironomus defectus*

Stictochironomus longipugionis; the ratio of this species in biomass is 7.68 %. Monthly mean of this species is 58.64 idv/m², station mean is 164.2 idv/m², and lake mean is 11.73 idv/m² (Fig. 10).

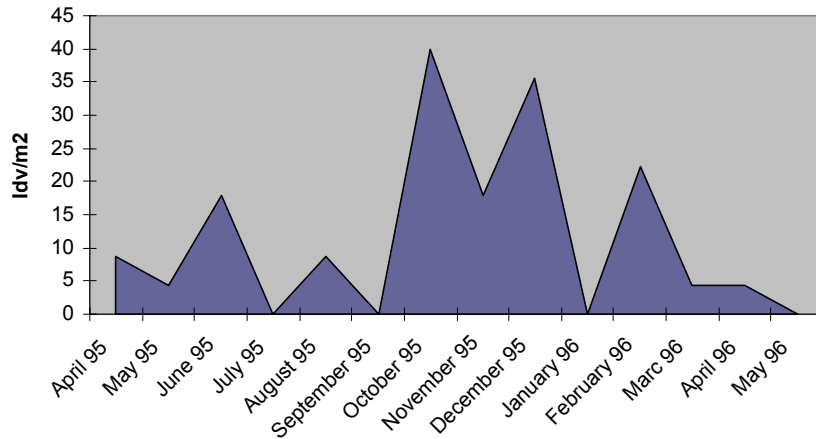


Figure 10. Monthly mean value of *Stictochironomus longipugionis*

Chironomus anthracinus; abundant of this species in the lake is 5.17 %. Monthly mean of this species is 39.5 idv/m², station mean is 110.6 idv/m², and lake mean is 7.9 idv/m² (Fig.11).

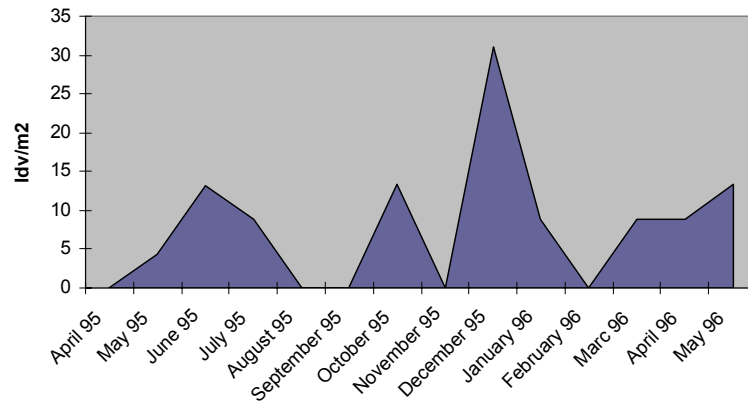


Figure 11. Monthly mean value of *Chironomus anthracinus*

Chironomus (Camptochironomus) tentans; this species has a ratio of 4.14 % in the lake. Monthly mean of this species is 31.64 idv/m², station mean is 88.6 idv/m², and lake mean is 6.33 idv/m² (Fig. 12).

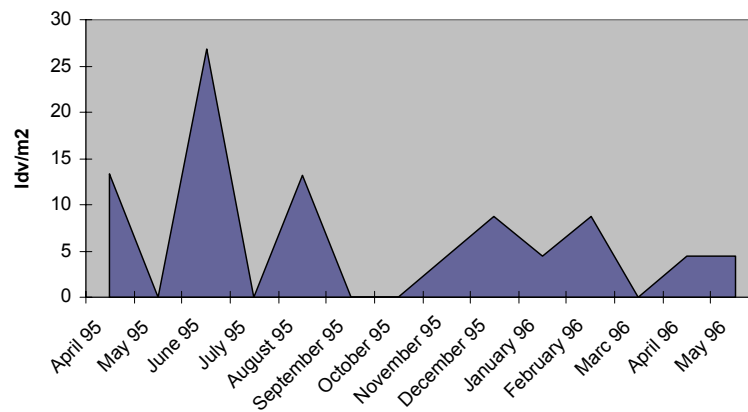


Figure 12. Monthly mean value of *Chironomus (Camptochironomus) tentans*

Chironomus thummi; this species is composed of 3.72 % of Chironomids in the lake. Monthly mean of this species is 28.43 idv/m², station mean is 79.6 idv/m², and lake mean is 5.69 idv/m² (Fig. 13).

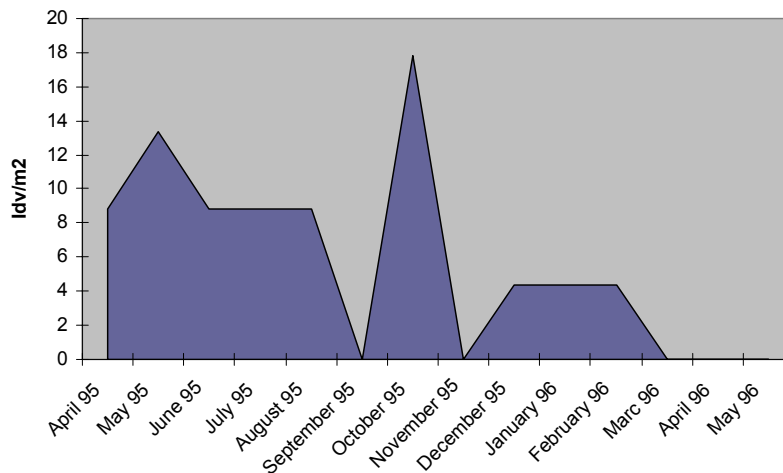


Figure 13. Monthly mean value of *Chironomus thummi*

Pentapedilum exsectum; this species is rare with a ratio of 2.27 % in the lake. Monthly means of this species is 17.29 idv/m², station mean is 48.4 idv/m², and lake mean is 3.46 idv/m² (Fig. 14).

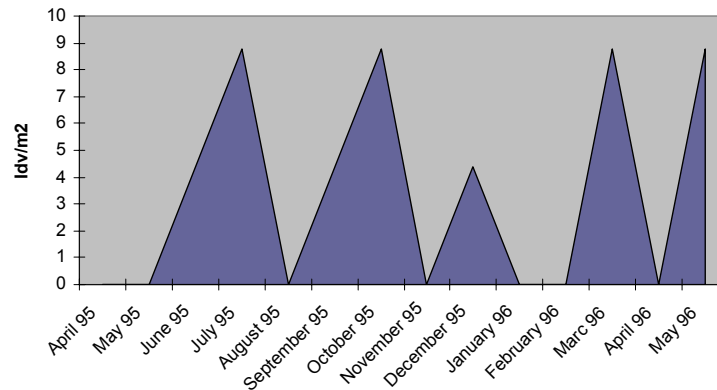


Figure 14. Monthly mean value of *Pentapedilum exsectum*

DISCUSSION

Larvae of chironomid picked three times, such as June 1995, October 1995, and December 1995. This pattern is consistent with normal distributional pattern of chironomid larvae. According to Chernowskii (1949), chironomids are larval stage during the wintertime; enter to pupa stage in springtime, then to adult stage. In Hazar lake, Şahin and Baysal (1972) recorded that Chironomid larvae are encountered in summer, autumn and winter, as in this study.

Sahin and Baysal (1972) recorded mostly *C. plumosus* and *C. defectus* from shallow parts of Hazar Lake. This condition shows that Hazar and Kesikköprü dam lake are eutrophic with respect to these two species.

Geldiay and Tareen (1972) collected *C. plumosus*, *C. tentans*, *C. anthracinus* from Gölcük lake, which called as Chironomus lake and eutrophic lake. *C. plumosus* is found of a ratio of 72 % in Gölcük lake, similarity, *C. plumosus* is 40.30 % in Kesikköprü dam lake.

According to Kırgız and Soylu (1975), *C. plumosus* is characteristic of eutrophication, and they recorded this species from dominantly both sediment and biomass in Apolyont and Manyas lakes. These lakes are similar to the Kesikköprü dam lake with respect to preference of habitat and abundant of *C. plumosus*. Also, *C. defectus* living in eutrophic lakes is determined in three lakes.

Şahin (1987a) collected *G. alboviridis* from mud and sandy sediment of Eğridir lake as in 4. station of Kesikköprü dam lake. According to Şahin (1987c), *C. anthracinus*, *C. thummi*, *G. alboviridis* live in Burdur, Beyşehir and Salda lakes, and these species change based on ground of lake and depth, generally live mostly mud-silt, moss-silt ground. This result is consistent with those of Kesikköprü dam lake.

Kırgız (1988) captured *C. defectus*, *C. thummi*, *C. plumosus*, *S. yalvaçii* from Seyhan dam lake, as in Kesikköprü dam lake

Şen and Özdemir (1990) worked on seasonal changes and fauna of chironomid in Heringet brook, found the highest value (4312 idv/m²) in spring and the least value (132 idv/m²) in winter. They recorded *C. plumosus*, *S. longipugionis* and *S. yalvaçii* from this lake as in Kesikköprü dam lake. *C. plumosus* is dominant in both Heringet brook and Kesikköprü dam lake.

According to Akıl et al. (1996), chironomid number of a year is 232 idv/m² in Cip dam lake, it reaches the highest level (593 idv/m²) in July and the least level (81 idv/m²) in December. These findings are different from those in Kesikköprü dam lake. *C. anthracinus*, *C. thummi*, *C. tentans*, *C. defectus*, *S. longipugionis* were determined from both lakes.

Chironomid species change monthly (Fig.2, 3). While chironomids were abundant in June and July, they decreased in both August and September, whereas water temperature was high. This result may be resulted from that cyprinids heavily fed on chironomid larvae in these months, also that larvae became adult and than removed from lake by flying.

In the basic of quality and quantitatively of benthic fauna, lakes were classified by life productivity. Chironomids are the first rank to show biological aspects of the lakes (Thienemann, 1954; Şahin, 1984). *C. thummi*, which is indicator of pollution water, was found in 2. station, which is a station polluted by human activity.

Of species of chironomid larvae, which are characteristic of eutrophic, *C. plumosus*, *C. tentans*, *C. defectus* live in Kesikköprü dam lake. Especially, *C. plumosus* has a ratio of 40.30 % among Chironomidae larvae, it is found in every station and in every month. Therefore, Kesikköprü dam lake seems to be eutrophic. Nevertheless, chironomid larvae are rich in individual (567.89 m²), biomass is 1.25 g/m², being less; however, it is rich in species, light transparency and oxygen are high. These factors show oligotrophic of the Kesikköprü dam lake.

REFERENCES

- Ahıska S. ve Karabatak M., 1994. Seyfe (Kırşehir) Gölününün Dip Faunası. Tübitak Türk Biyoloji Dergisi 18 (1): 61-77.
- Altındağ A., Yiğit S., Ahıska S. and Özkurt Ş., 1998. The Growth Features of Tench (*Tinca tinca* L., 1758) in the Kesikköprü Dam Lake. Tr. J. Zoolgy 22: 311-319.
- Altındağ A., Yiğit S., Ahıska S. and Özkurt Ş., 1999. The Growth Features of Pike (*Esox lucius* L., 1758) in the Kesikköprü Dam Lake. Tr. J. Zoolgy 23: 901-911.
- Akıl A., Ayvaz Y. ve Şen D., 1996. Çip Baraj Gölü (Elazığ) Chironomidae (Diptera) Larvaları. Tr. J. Zoolgy, 20: 217-220.
- Anonymous., 1990. İşletme Hidrolojisi. Kesikköprü Baraj Gölü Su Ürünleri Projesi. Bayındırlık ve İskan Bakanlığı DSİ Genel Md. İşletme ve Bakım Dairesi Bşk. Ankara.
- Brundin L., 1949. Chironomidae und Ondere Bodentiere Der Südschwedische Urgebirgseen Inst., Freshwater Res., Drotningholm. Rep., 3. 1. 914.
- Çetinkaya O., 1991. Akşehir Gölü Su Kalitesi, Plankton Ve Bentik Faunası üzerine Bir Araştırma. Su Ürünleri Dergisi. Ege Üniv. Su Ürünleri Yük. Oku., 8(29-30): 60-68
- Fittkau E. ve Reiss F., 1978. Chironomidae in Illies, J. (ed) Limnofauna Europae. 404-440. Gustav Fischer Verlag.
- Fittkau E. ve Reiss F., 1986. Chironomus. Mitteilungen Aus der Chironomidenkunde-Plön. München.
- Geldiay R. ve Tareen i. U., 1972. Gölcük Gölü Dip Faunası, Ege Üniv. Fen Fak. İlimi Raporlar Serisi 137. (Biyoloji 84) Ege Üniv. Matbaası. Bornova-İzmir 1-15.
- Geldiay R., 1949. Çubuk Barajı ve Eymir Gölü'nün Makro ve Mikro Faunasının Mukayeseli Olarak İncelenmesi. Ank. Üniv. Fen. Fak. Mec. 2: 146-252.
- James A., 1979. The Value of Biological Indicators in Relation to other Parameters of Water Quality in James, A. and Evison, L., Biological Indicators of Water Quality, John Willey and Sons. Chichester pp. 1-1, 1-16.
- Kırgız T. ve Soylu E., 1975. Apolyont ve Manyas Göllerindeki Su Ürünleri Üretimini Etkileyen Dip Fauna Elementlerinin Yıllık Görünüm ve Yayılışları. TÜBİTAK V. Bilim Kongresi. VHAG. Araşt. Grubu. Ankara 387-393.
- Kırgız T., 1988. Seyhan Baraj Gölü Bentik Hayvansal Organizmaları ve Bunların Nitel ve Nicel Dağılımları. Doğa Tu. Zool. D. 12 (3): 231-245.
- Kırgız T., 1989. Gala Gölü Bentik Faunası. Anadolu Üniv. Fen Ed. Fak. Der. 1(2): 67-87, Eskişehir.
- Lagler K. F., 1956. Freshwater Fishery Biology, W. M. C. Brown Company, Publishers Dubuque, Iowa.
- Özdemir L. ve Şen D., 1991. Keban Baraj Gölü Ova Bölgesinde Bulunan *Procladius* sp. ve *Chironomus halophilus* Larvalarının Mevsimsel Dağılımları. Su Ürünleri Derg. Ege Üniv. Su Ürünleri Yük. Ok. 8 (29-30): 60-65.
- Özkan N. ve Kırgız T., 1995. Edirne Bölgesi Chironomidae (Diptera) Larvaları ve Yayılışları. Tr. J. of Zoology 19: 257-264.
- Pennak R. W., 1978. Freshwater Invertebrates of United States. 2. Baskı. New York. 803.
- Polatdemir N. ve Şahin Y., 1997. Eskişehir ve Çevresi Durgun Su Sistemleri Chironomidae (Diptera) Larvaları. Tr. J. of Zoology 21: 315-319.
- Şahin Y. ve Baysal A., 1972. Hazar Gölü Dip Faunası ve Yayılışları. İst. Üni. Fen Fak. Hidrobiyo. Araş. Enst. İçsular Araş. Kısmı. İst. Üniv. Fen Fak. Basımevi 9: 1-33.
- Şahin Y., 1980. Elazığ ve Kısmen Çevre İllerinin Chironomidae (Diptera) Limnofaunasının Tespiti ve Taksonomik İncelenmesi. Fırat Üni. Vet. Fak. Derg. Cilt V., No: 1.
- Şahin Y., 1984. Doğu ve Güneydoğu Anadolu Bölgeleri Akarsu ve Göllerindeki Chironomidae (Diptera) Larvalarının Tesbiti ve Dağılımları. Anadolu Üniv. Yayını. No: 57. Fen Ed. Fak. Yay. 2.
- Şahin Y., 1986. Akdeniz ve İç Anadolu Bölgeleri Akarsuları Chironomidae Larvaları ve Yayılışları. TÜBİTAK TBAG Proje No: 792.
- Şahin Y., 1987a. Eğirdir Gölü Chironomidae (Diptera) Larvaları ve Yayılışları. Doğa Tu. Zool. D. 11 (1): 60-66.
- Şahin Y., 1987b. Doğu Anadolu'da Tespit Edilen Yeni Chironomidae (Diptera: Chironomidae) Türleri Doğa Tu. Biyo. Der. 11 (2):51-58.
- Şahin Y., 1987c. Burdur, Beyşehir ve Salda Gölleri Chironomidae (Diptera) Larvaları ve Yayılışları. Doğa Tu. Biyo. Der. 11 (2):59- 70.
- Şahin Y., 1987d. Chironomidae Limnofauna van der West Türki. Anad. Üniv. Yay. No: 235. Fen-Ed. Fak. Yay. No:12.
- Şahin Y., 1987e. Marmara, Ege ve Sakarya Sistemi Akarsuları Chironomidae (Diptera) Larvaları ve Yayılışları. Doğa Tu. Zoo. Derg. 11 (3): 179-188.
- Şahin Y., 1991. Türkiye Chironomidae Potamofaunası. Tübitak Temel Bilimler Araş. Grubu Proje No:TBAG. 869.
- Şen D. ve Özdemir Y., 1990. Heringet Çayı Chironomidae (Diptera) Larvalarının Mevsimsel Dağılımları. Su ürünleri Derg. Ege Üniv. Su Ürün. Yük. Oku. 7 (25-26-27): 178-185.
- Tanyolaç J. ve Karabatak M. 1974. Mogan Gölünün Biyolojik ve Hidrolojik Özelliklerinin Tesbiti. Tübitak, Vhag Proje No: 91, Ankara.
- Thienemann A. 1954. Chironomus, Leben, Verbreitungen und Wirtschaftliche Bedeutung Der Chironomiden. Binnengewasser. 2: 1-834.
- Ustaoglu M. R. 1980. Karagölün (Yamanlar-İzmir) Bentik Faunası (Oligochaeta, Chaoboridae, Chironomidae) Üzerinde Araştırmalar. Tübitak VII. Bilim Kkongresi Mat. Fiz. Ve Biyolojik Bilimler Araş. Grubu. Kuşadası, Aydın. 331-344.
- Wilhm J. J., 1975. Biological Indicators of Pollutions, In Witton, B. A. (Ed). River Ecology, Blackwell Scientific Publ. Osney Mead. Oxford pp.
- Yiğit S., 2001. Kesikköprü (Ankara) Baraj Gölü Zooplankton Faunası Üzerine Bir Çalışma. G.Ü.Fen Bil. Ens. Dergisi. Cilt.14 No.4, s.1387-1395.
- Yiğit S., 2002. Seasonal Fluctuation in the Rotifer Fauna of Kesikköprü Dam Lake (Ankara, Turkey). Tr. J. Zoolgy 26: 341-348.