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Aksehir Lake Ecological Property and Problems in Lake Strict (Konya Closed Basin of Turkey)[#]

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Abstract: Turkey has many water sources more than other Middle East countries, but less than European countries. Water sources information, determination of potential and management are important for future water production plan. Water sources in Turkey were reduced with uncontrolled usage, as it will not be come to an end of the source. Aksehir Lake was an important water source in Lake Strict and many investigations were performed on biologic feature of the region, but were not on environmental problems. The Aksehir district is located at the junction of the borders of the Central Anatolian, Mediterranean and Aegean geographical regions of Turkey. The strict is on the way of many migratory birds (Flamingo *etc.*) and needs to be protected for the endemic species in the world. The Lake is nearly dried in last decade because of global warming with low precipitation and uncontrolled irrigation of the agricultural fields. The purposes of this study is determination of ecological properties with a view of Aksehir Lake surface water situation as a water resource for the region and try to give some suggestions of solution on the environmental problems.

Key Words: *Aksehir Lake, Ecological property, global worming, ecology, strict, Flamingo*

Introduction

Although Turkey is richer then Middle East country for water source, but it has not enough water sources as much as European country. Even the water amount is adequate, it does not show that it does not finish. Wetlands are classified according to international criteria:

1st class wetlands: The shelter places and feed in about 25,000 birds, and 2nd class wetlands: shelter places and feed in between 25,000-10,000. Turkey's 1st class wetlands as international status are Ulubat Lake, Eber Lake, Aksehir Lake, Eğirdir Lake, Karamık Lake, Beyşehir Lake, Büyük Menderes Delta, Tuz Lake, Seyfe Lake, Sultan reedy, Akyatan Lagoon, Yumurtalık Lagoon, Göksu Delta, Balık Lake, Hotamış Lake, Gala Lake; 1st class wetlands are Akgöl (Sakarya), Marmara Lake, Çavuşlu Lake, Burdur Lake, Acı Lake, Kulu Lake, Çapalı Lake, Suğla Lake, Yeşilırmak Delta, Muş meadow, Van Lake, Yüksekova reedy, Çıldır Lake, Ereğli marsh, Köyceğiz Lake, Iğdır Cirik (1993). Wetland can also absorb the exceeding water after precipitation as like a sponge and store for agricultural area during dry period. They can also prevent to overflowing, erosion and decrease nitrate and phosphate pollution with containing high biological content. They treat the water and stabilize the costal band. These valuable ecosystems were changed or destroyed with impressing to ecological and hydrological system by urbanisation, environmental pollution, and industrial activity. When the wetland characters were not taken into consideration, negative results will be arisen. In recent day, many wetlands of the countries were damaged or destroyed (Doğan, 1990). There are many investigations on Aksehir Lake located in Lake strict. Location of Aksehir Lake is given in Figure 1.

Aksehir Lake located in 38° 32' North 31° 28' East coordination, surface area of the lake is 304.4 km² at 4.5 m depth; elevation from the sea is 956 m. Aksehir Lake has been located in the valley between Sultan Mountains and Emir Mountain. It located between Konya and Afyonkarahisar cities land. There is not any protection status of the district. It is a closed basin and there is not flow out. Its salt concentration is not high. Emerging waters from stream around the lake carry precipitation of rain so on, that water content is the lake suitable for irrigation and to use drinking water source at the side of the lake, but salt concentration is increasing to wrath central area.

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Lake is being feeding with streams coming from Sultan Maintain during season and some permanent rivers, and also underground water flow way is to lake direction. Out flow is via evapo-transpiration and usage for irrigation of agricultural area around the lake.

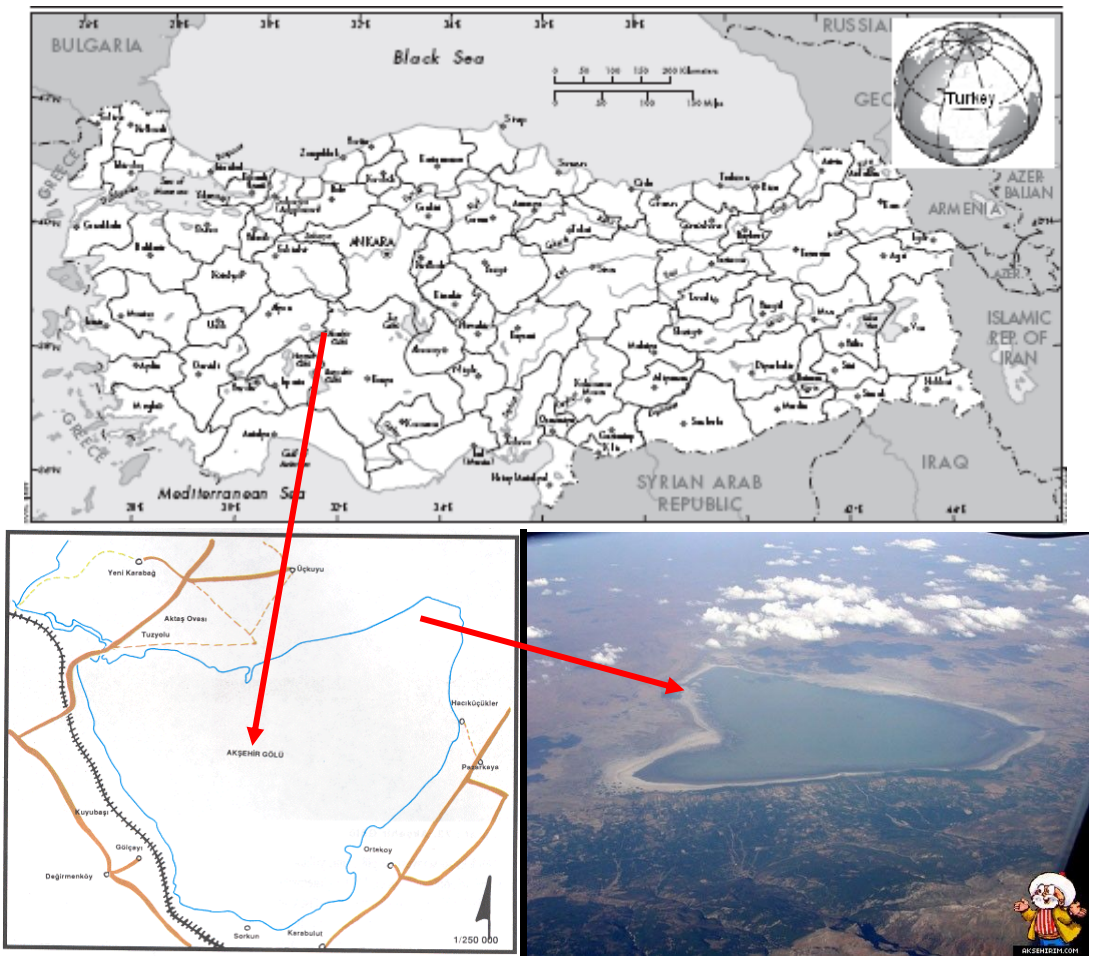

Figure 1. Location of Akşehir Lake

There was a connection point with Eber Lake via Taşköprü creek in the past, but it was preventing constructing DSI channel regulator and irrigation cannel.

There is incredible fluctuation on lake level and surface area during years and seasons. During 1961-1991 observations period minimum water level is at November 1963. According to this record, minimum lake level elevation from the sea is 955.01 m, surface area 25 500 he and water capacity 460 million m^3. On the other hand maximum water level was measured at Mayıs 1970, water level altitude is 959.76 m, and water capacity is 2.1 billion m^3. It was a shallow lake; water depth is change between 2 to 4 meters.

Akşehir Lake is a shallow lake and water depth is changing between 2 to 4 m. There is sparse reedy but large area covered about 10 km border at the south-east side of lake. There are willow communities in the rivers delta (URL 1). Water sources of the Akşehir Lake are Eber Lake and rivers of Sultandağı.

Akşehir Lake is a eutrophyic lake. Water quality, plankton and benthic flora and fauna were investigated by Çetinkaya (1989) that benthic fauna of the lake formed by Chironomidae and Oligochaeta, but he did not give more detail information. Benthic fauna of the Aksehir lake were studied for "Investigation biology and ecological of Five International Important Wetland" Book, and *Chironomus thummi* and *Dicrotendipes tritomus* species belong to Chironomidae family were found (Anonim, 1993).

Flora and fauna of the lake show similarity with the Eber Lake. Although it's ecological riches is not as high as Eber Lake, but it is in a eutrophic lake classes. There are five important fish species as

commercially beside to carp and crane fishes in the lake. Aksehir Lake is in ornithological specialty of Turkish lakes. All bird species living, hosting and reproducing in Eber Lake are also found in Aksehir Lake. Large reedy cost area is a suitable place as broody area, feeding place, shelter and meeting place for the birds. More sparse reedy coverage than Eber Lake can give opportunity to bird hiding place from the hunter. Large water cost can protect to birds against to hunters.

During spring and autumn season, specially wild goose and ducks, pelicans, herons, gull, about 60-80 thousand bird may be seen around the Aksehir Lake. Especially, a crowded wild goose population may spend night time in the lake. The highest goose population (107,000) in the Turkey was recorded around Akşehir Lake in April 1977 by Gürpınar. During very cold winter period about 1-2 months, lake surface can be icy, so lake do not host the birds that period (URL 1).

Table 1. Some meteorological data for Akşehir town (Alp *et. al*. 1994)

Year	Average rain, mm	Max. Temp. °C	Min. Temp. °C
1981	554.5	34.6	-11.2
1982	508.6	34.5	- 9.6
1983	647.3	34.4	-15.8
1984	491.5	34.6	-10.2
1985	581.6	34.8	-17.8
1986	369.8	35.0	-11.0
1987	641.1	35.1	-14.1
1988	657.3	34.9	-10.5
1989	469.1	34.3	-17.0
1990	452.7	33.3	-13.9
1991	610.8	34.0	-19.6
1992	479.4	33.0	-16.5
1993	385.3	35.5	-20.8

Table 2. Monthly average Temperature (°C) and Monthly average rain (mm) for Akşehir town

	J	F	M	A	M	J	J	A	S	O	N	D
Monthly aver. Temp.(°C)	1.2	2.7	5.9	11.1	15.9	19.6	22.5	22.5	18.3	12.9	8.3	3.3
Monthly aver. rain, (mm)	86.6	74.6	81.1	69.6	66.7	50.9	15.2	10.7	25.2	47.2	52.4	81.0

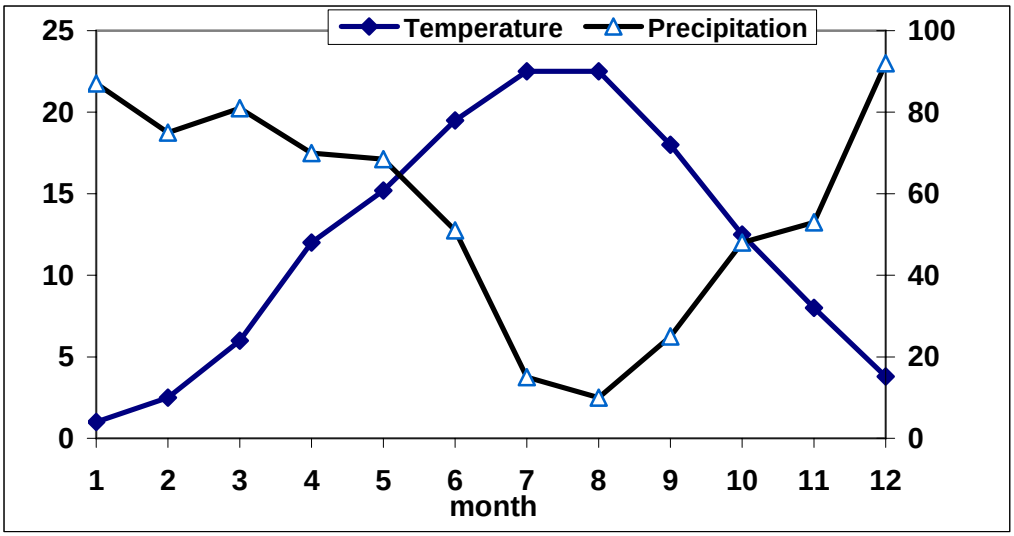

Figure 2. A Hygro-therm graph produced with Aksehir town's temperature and precipitation data (Anonim, 1984b)

Results and Discussion

Study area

Investigation area has a transition climate between central Aegean central Anatolian region and upon the winds. Average annual precipitation is about 600 mm. According to Akman (1990) Aksehir has a semi-arid Mediterranean climate with rain mainly in spring and winter. Sometimes, Aksehir Lake was almost covered by the ice during winter season. Around Aksehir lake was surround by reedy and rush plants. Plants' occupied area has about 25-30% of the total lake area. According to Alp *et. al.* (1994) study electrical conductivity salinity was increasing during spring with increasing precipitation and water in come, continued in summer reaching maximum in August, and then lowered.

Only genus level algae phytoplankton formation in Aksehir Lake was given in previous studies (Anonim, 1993; Çetinkaya, 1993). Costal algae of the lake were not detail investigated. Where as costal flora and fauna were more important for lake ecological community and nutrient productivity. This study was performed to investigate composition and seasonal density change of Aksehir lake costal algae which is one of important lake taking part of lake strict of Turkey's reach water resource. The lake has been accepted by Cultural Ministry, Konya Cultural and Natural Area Protecting Committee as a 1st Degree Natural Protected Area on July 01, 1992 (Anonim 1993).

Elmacı (1995) measured physical and chemical characters of lake water during investigation period showed that it is low salty and slightly alkali. Climatic character of region is with low precipitation in Mediterranean climate (Anonim 1984; Akman 1990). Global warming and dryness has negative effect on the birds living around the lake. After last visit of the flamingos, they died without water and food by one by with drying lake area and changing to desert (Atilla 2008). Number of died flamingos were reached to hundred in the drying lake (URL 2).

Figure 3. Flamingos at two different time periods, before and after drying period

Decrease reason of water level in the lake:

- Social problems due to ownership of land around the lake,
- Uncontrolled reed cutting,
- Unconscious hunting and fishing,
- High transpiration due to larger water surface related to dept of lake,
- Wastewater discharge to the lake basin.

Reed processing work continuing for 50yeaars was effected destroyed reedy area with drying of lake water. About 1,500 tonnes of reeds were produced during 1999-2000 years period around lake, and production was 58 tonnes in 2002 year at last then no production after drying of lake.

Region was an important cherry production area, but cherry production was effected with changing region microclimate. Aksehir's Napoleon type cherry was importing to Nederland, Italy and England, climate of region was changed with drying lake water. This change of climatic change also effected to economical level of region by effected all fruit production. Relative humidity was decreased from 70% to 40% and fruit quality was affected by changing climate (URL 3).

Cut reeds from the lake area were bought and used in SEKA Paper Factory at Afyon city, Çay town. Collection of reeds continuo all years, this affects nest and eggs of the bird living between reeds. On the other hand, second important risk is hunting for region birds. All activity is damaging ecosystem of lake which is one of the International Protected Wetland Status. Similar activities, on the

other places non International Protected Wetland Status, affected wild life. Wetland management Plan must be presented to save Aksehir lake ecology and wild life around lake as soon as possible (URL 4).

Figure 4. View of Aksehir Lake at earlier time period and later

Result and Suggestions

Water usage must be economical to save water source and take consideration on economical usage method in agricultural application. Farmer around lake using lake or string water for agricultural irrigation mast is educated on watering method. They must know how, when, how much water will be used in agricultural area to increase productivity. To reduce in coming pesticide and synthetic fertiliser into the lakes, farmer must know usage of these chemicals.

The lake was hosting thousands of birds and fishes, even growing lobster in the lake, but at the moment it is not possible to see any nomadic bird around the Akşehir Lake. Nomadic birds are not coming to Aksehir Lake; they are passing over the lake and going to other wetlands. The strict is very important for the flamingos, so that to save flamingos needs to present some foods and water ponds around the lake during their visiting period. Presentation of the pond is more economical then dam for short period usage.

To save the lake future must be taken some measures given below:

1- Connection of rivers incoming to lake must not cut,
2- Deep well boring activity and pulling water from old well must be stopped around the lake,
3- Minimise water usage and dripping system mast be prefer instead of ordinary watering,
4- Hunting around the Aksehir Lake must be controlled,
5- Sheep must not pasture during incubation period, reed must not cur and fire in incubating term of birds.
6- Precipitation ratio may be increased planting with suitable trees over arid areas,

Surface area of the Aksehir lake estimated as 1 km2 in 2008, it was decreased to 35 km2 2005 decreasing to 95 km2 2004, It was 350 km2 early estimation. Surface was nearly dried in last 10 years. It was turned only a small water pond in 2009. It may be possible to save lake stopping all water use from the lake and wait a rainy period as a lack.

References

Akman, Y, (1990) *Iklim ve Biyoiklim*. Palme Yayıncılık, *(in Turkish)* s. 319, Ankara.

Alp A, Akyürek M., (1994) *Akşehir Gölünün Bazı Biyoekolojik Özelliklerinin Tesbiti Projesi* – Sonuç Raporu, Tarım ve Köyişleriİ Bakanlığı Su Ürünleri Araştırma Enstitüsü Müdürlüğü Eğirdir. *(in Turkish)*

Anonym., (1984b) Meteoroloji Bülteni, Ortalama ve ekstrem sıcaklık ve yagıs degerleri. T.C. Basbakanlık Devlet Meteoroloji Isleri Genel Müd. *(in Turkish)* Ankara

Anonym., (1993) *Biological and Ecological Investigation of Five Wetlands (Akşehir, Beyşehir, Hotamış, Karamuk Lakes and Ereğli Marsy Place)* Possessing International Importance (in Turkish). The Environment Proficient of Turkish, 263 pp. Ankara.

Çetinkaya O, (1989) *A Study on Water Quality Plankton and Benthic Fauna of Akşehir Lake (in Turkish)*, Akdeniz Üniversitesi Su Ürünleri Yüksekokulu, Eğirdir, 66-80.

Çetinkaya O, (1991) Aksehir Gölü su Kalitesi, plankton ve bentik faunası üzerine bir arastırma. Göller Bölgesi Tatlı Su Kaynaklarının Korunması ve Çevre Sorunları Sempoyumu, s. 413-429, *(in Turkish)* Isparta.

Cirik S, (1993) Sulak Alanlar, Ekoloji NisanMayısHaziran, Sayı 7 syf 50. *(in Turkish)*

Duğan PJ, (1990) Sulak alanların koruması Doğal Hayatı Koruma Demeği, pp: 96 *(in Turkish)* İstanbul.

Elmacı A, (1995) Aksehir (Konya) Gölü Fitoplanktonu ve kıyı bölgesi (Littoral bölge) alglerinin ekolojik ve floristik olarak incelenmesi. A. Ü. Fen. Bil. Enst. Doktora Tezi (Yayımlanmamıs), Ankara.

Memiş A 2008 Akşehir 7 Ağustos (Konya), (DHA).

URL 1 http://www.cevreorman.gov.tr/sulak/sulakalan/aksehir.htm

URL 2 www.konyagenctema.org, 12.08.2008

URL 3 www.yenisafak.com.tr , 11 Mart 2009

URL 4 www.konyacevreorman.gov.tr