

*Bulgarian Journal of Agricultural Science, 14 (No 2) 2008, 195-200*  
*National Centre for Agrarian Sciences*

## **AS AN EXAMPLE OF ECOLOGICAL DEVASTATION EGIRDİR LAKE (TURKEY)**

M. R. OZEN<sup>1</sup>, I. I. TURNA<sup>1</sup> and K. CINAR<sup>2</sup>

<sup>1</sup>*Suleyman Demirel University, Fisheries Faculty, 32500-Egirdir-Isparta, Turkey*

<sup>2</sup>*Suleyman Demirel University, Science and Art Faculty, 32100-Isparta- Turkey*

### **Abstract**

OZEN, M. R., I. I. TURNA and K. CINAR, 2008. As an example of ecological devastation Egirdir lake (Turkey). *Bulg. J. Agric. Sci.*, 14: 195-200

Egirdir Lake is placed Anatolian Peninsula in 500 km<sup>2</sup>, its mean depth takes 16 meters. They are made use of watering and due to oligotrophic characteristic and drinkable water besides fishing (Fish and Crayfish). Since 1950, 9 different species of fishes of Cyprinidae were lived this lake. There were cause irreversible alterations by way of implantation of pike-perch (*Sander lucioperca*) in here for to aim more economical production. In the first year while the while the level of prosperity of the people rising, and the following years there were obtained catching low recolte neither carp nor pike-perch catching. Local government and fisherman were negative effected in this situation, and they were implantation in the lake in early 1990. In this implantation who nobody knows *Carassius auratus gibelio* Bloch, 1783 was implanted in this lake. This species which is rapidly increased more rapidly growth and more become dominant species than pike-perch. Velvet fish (*Tinca tinca*) were implanted in Egirdir Lake in 1996. But they couldn't become any their population. They were found 10 different species by Balik et al. (2002) in Lake Egirdir. The last implantation in Egirdir Lake was silver fish (*Atherina boyeri*) while there were caught 80 tons carps, 300 ton pike-perch in 1985; 5.5 ton carp and 4 ton pike-perch were caught in 2004. Depend on decreasing of the pike-perch's body criterion, economical production of this fishes was also decreased. In this situation of the lake ecosystem is worried about Local government and fisherman. In this study, some hydrobiological characteristics of the lake were defined and the negative changes of the fish population were also examined.

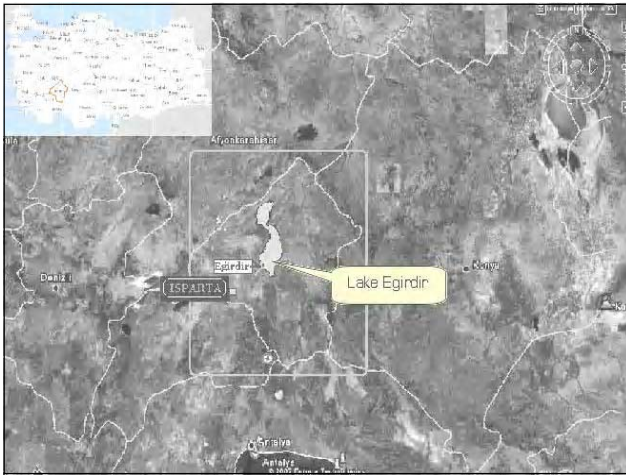
*Key words:* ecological devastation, Egirdir Lake, Mesotrophic Lake

### **Introduction**

The Egirdir Lake is placed within South-West Mediterranean Region of Turkey. Egirdir lake is geographically placed between 030° 57 43 and 030° 44 30 East longitudes and 37° 50 41 and 38° 16 55 North Latitudes (Figure 1).

Egirdir Lake which is 48 km long within North-South direction tends and it seems to be separated into two parts which are 2.1 km wide. Its northern parts are called Lake Hoyran and southern part is named Egirdir Lake. The widest part is 16 km, the maximum depth is 12.5 meters and its averages depth is 6.7 meters (Petr, 1984; Ikiz and Kesici, 1997).

*E-mail: mrustuozen@gmail.com*



**Fig. 1. Egirdir Lake (Google Earth, 2007)**

Average altitude of Egirdir Lake is 918 meters and surface area is 482.77 square kilometers. Its maximum elevation volume is 4578.73 hm<sup>3</sup> (Ikiz and Kesici, 1997). Inflows are springs, small rivers underground input; water loses are irrigation uptake, dolines, evaporation and irrigation canal. Sometimes, lake is covered with ice (Ikiz and Kesici, 1997).

Aquatic plants of the lake are seen plentiful in spring and summer seasons. Emergent plants are dominated by *Phragmites* sp., submerged plants by *Myriophyllum spicatum*, *Chara* sp. and *Potamogeton* spp. (Petr, 1984; Timur et al., 1986).

While the surface of Egirdir Lake sometimes was covered by ice in winter, its surface water temperature increases 25°C in summer times. Its average water temperature changes range from 11.5°C to 15.5°C (Geldiy, 1984; Ikiz and Kesici, 1997).

When there are taking into consideration amount of Nitrate and phosphate; it can be classified as mesotrophic lake. Some criteria of water qualities were given in Table 1.

There are 37 taxa dispersion in Egirdir Lake's phytoplankton. Those belonging to *Bacillariophyta*'s species are dominant (Table 2).

The zooplanktons of the lake are including Rotifera, *Cladocera* and *Copepoda*'s species. On account the pollution in the lake there is an increase on the *Rotifera* group. The species of zooplankton determined from studies of lake are given below (Table 3).

<http://www.google.com/googlearth.com>, 2007

**Table 1**  
**Some water quality of Egirdir Lake**  
(Ertan et al., 2001)

pH	8.27-8.54
Dissolved Oxygen (mg.l <sup>-1</sup> )	8.82-9.12
Cl <sup>-</sup> (mg.l <sup>-1</sup> )	15-18
Electr. Cond. (µsn.cm <sup>-1</sup> )	325-368
HCO <sub>3</sub> <sup>-</sup> (mg.l <sup>-1</sup> )	203-228
CO <sub>3</sub> <sup>-</sup> (mg.l <sup>-1</sup> )	19-21
SO <sub>4</sub> <sup>-2</sup> (mg.l <sup>-1</sup> )	09.5.2012
Ca <sup>+2</sup> (mg.l <sup>-1</sup> )	42.3-47.3
Mg <sup>+2</sup> (mg.l <sup>-1</sup> )	58.2-60.3
Organic material (mg.l <sup>-1</sup> )	11.2-13.1
NO <sub>3</sub> <sup>-</sup> (mg.l <sup>-1</sup> )	1.15-2.16
NO <sub>2</sub> <sup>-</sup> (mg.l <sup>-1</sup> )	<0.01
PO <sub>4</sub> <sup>-3</sup> (mg.l <sup>-1</sup> )	0-0.07
Secchi Disc (m)	2.85-5.70
Chl- a (mg.m <sup>-3</sup> )	5.56

**Table 2**  
**Phytoplankton of Egirdir Lake**  
(Ertan et al., 2001)

Divisions	Taxon
<i>Bacillariophyta</i>	20
<i>Chlorophyta</i>	10
<i>Cyanophyta</i>	4
<i>Pyrrophyta</i>	2
<i>Chrysophyta</i>	1
Totally	37

Macrobenthic fauna make up of *Oligochaeta*, *Hirudinea*, *Isopoda*, *Amphipoda*, *Turbellaria*, *Diptera*, *Ephemeroptera*, *Pelecypoda* and *Gastropoda* groups. It consist of 70.87% *Mollusca*, 19.85% *Oligochaeta*, 5.97% *Crustacea*, 2.95% *Chrinomidae* larvae and 0.40% other fauna groups. Moreover Crayfishes (*Astacus leptodactylus*) economically has an important role in the lake (Bildiren 1991; Bolat et al., 2007).

#### **Occurrences of the Devastation in the Lake**

The first information related with the fish fauna in

**Table 3**  
Zooplanktons of Egirdir Lake (Ertan et al., 2001)

Divisions	Taxon
Rotatoria	<i>Keratella cochlearis</i>
	<i>Keratella quadrata</i>
	<i>Trichotria pocillum</i>
	<i>Trichocerca longiseta</i>
	<i>Monostyla bulla</i>
	<i>Flinia terminalis</i>
	<i>Brachionus sp.</i>
	<i>Asplanchna sp.</i>
Cladocera	<i>Leptodora kindtii</i>
	<i>Sida cristallina</i>
	<i>Diaphanosoma brachyurum</i>
	<i>Daphnia longissipina</i>
Copepoda	<i>Eudiaptomus vulgaris</i>
	<i>Diaptomus sp.</i>
	<i>Mesocyclops leucarti bodanicola</i>
	<i>Cyclops sp.</i>

the Egirdir Lake, goes to 1938. In the scientific study, by Pietschmann 3 Cyprinid form was described than the studies made until 1955, 9 different fish species were described (Table 4).

In this years especially *Cyprinus carpio* and *Capoeta pestai* fished and seen as a economic way (Nümann, 1958), not economically important fish the mosquito fish, *Gambusia affinis* (Baird and Girard, 1853) for the lake was implanted as a precaution to mosquito and malaria diseases. One of the predator fish the pike perch's fry, *Sander lucioperca* were brought to the lake from Austria by the scientist of Istanbul University Hydrobiology Department. Since this year the fish fauna in the lake has changed a lot from the aspect of economically and ecologically. These are;

- The fish preferred more with its delicious taste and economic and have been adopted to the lake and fished,
- The decrease in natural fish of the lake,
- As a consequence of his consumption other fish

**Table 4**  
Fish fauna of the Egirdir Lake in 1955's (Küçük et al., 2007)

Family	Species
Cyprinidae	<i>Cyprinus carpio</i> (L., 1758)
	<i>Vimba vimba</i> (L., 1758)
	<i>Capoeta pestai</i> (Pietschmann, 1933)
	<i>Pseudophoxinus handlirschi</i> (Pietschmann, 1933)
	<i>Hemigrammocapoeta kemali</i> (Hanko, 1924)
	<i>Pseudophoxinus egridiri</i> (Karaman, 1972)
Cobitidae	<i>Cobitis turcica</i> Hanko, 1925
	<i>Barbatula mediterraneus</i> , Erk'akan, Nalbant and Özeren, 2007
Cyprinodonti- dae	<i>Aphanius anatoliae anatoliae</i> (Leidenfrost, 1912)

and small fish, eggs, and larva and there were observed that native fish of the lake has arisen and more fishing (Cubuk et al., 2007).

In the forthcoming years the pike perch population has improved with his length-weight and has become the dominant one. In this term both the condition of fish caught from the lake and the quality of the fish which can be imported has made the fisherman and local people happy. In this term the native fish *Hemigrammocapoeta kemali* (Hanko, 1924) and *Pseudophoxinus handlirschi* (Pietschmann, 1933), became extinct (**EX**) and *Capoeta pestai* (Pietschmann, 1933) and *Pseudophoxinus egridiri* (Karaman, 1972) were critical endangered (**CR**). The golden age was continued to the end of 1980's years.

Between 1980 and 1995 the distribution of obtain by fishing, is showed on Table 5.

The diminishing weight of fish caught Egirdir Lake and its being unconditioned has made fisherman search new ways (so it can't be imported and its price di-

**Table 5**

The fishes which were fished in Egirdir Lake from 1980th to 1995th Year (kg) (Küçük et al., 2006 ; Küçük et al., 2007 ; Çubuk et al., 2007)

Years	Fish Species			Totally
	<i>C.carpio</i>	<i>S.lucioperca</i>	<i>V.vimba</i>	
1980	120000	450000	15,000	585,000
1985	80000	300000	0	380,000
1990	35000	110000	0	145,000
1995	66000	130000	0	196,000

**Table 6**

Today's fish fauna in Egirdir Lake (Küçük et al., 2007; Çubuk et al., 2007)

Taxon	Origin	Threatened categories
<b>Cyprinidae</b>		
<i>Cyprinus carpio</i> (L., 1758)	Natural	Presence
<i>Vimba vimba</i> (L., 1758)	Natural	Presence
<i>Hemigrammocapoeta kemali</i> (Hanko, 1924)	Natural	Absent (EX)
<i>Pseudophoxinus handlirschi</i> (Pietschmann, 1933)	Natural	Absent (EX)
<i>Capoeta pestai</i> (Pietschmann, 1933)	Natural	Presence (CR)
<i>Pseudophoxinus egridiri</i> (Karaman, 1972)	Natural	Presence (CR)
<i>Carassius gibelio</i> (Bloch, 1782)	Wild (1990–1994)	Presence
<i>Tinca tinca</i> Linnaeus,	Wild (1996)	Presence
<i>Chalcalburnus calcoides</i> Güldestadt, 1772	Wild (2000)	Presence
<b>Balitoridae</b>		
<i>Seminemacheilus ispartensis</i> Erk'akan, Nalbant and Özeren, 2007	Natural	Presence
<i>Barbatula mediterraneus</i> Erk'akan, Nalbant and Özeren, 2007	Natural	Presence
<b>Cobitidae</b>		
<i>Cobitis turcica</i> Hanko, 1925	Natural	Presence
<b>Gobiidae</b>		
<i>Knipowitschia caucasica</i> (Berg, 1916)	Natural	Presence
<b>Cyprinodontidae</b>		
<i>Aphanius anatoliae anatoliae</i> (Leidenfrost, 1912)	Natural	Presence
<b>Percidae</b>		
<i>Sander lucioperca</i> (L., 1758)	Wild (1955)	Presence
<b>Atherinidae</b>		
<i>Atherina boyeri</i> Risso, 1810	Wild (2003)	Presence
<b>Poecilidae</b>		
<i>Gambusia affinis</i> (Baird and Girard, 1853)	Wild (1950–1960)	Presence

CR: Critical Endangered, EX : Extinct

**Table 7**

**The fishes which were fished in Egirdir Lake from 2001st to 2006th year (kg)  
(Cubuk et al., 2007)**

Years	Fish species						Totally
	<i>C. caprio</i>	<i>S. lucioperca</i>	<i>V. vimba</i>	<i>C. gibelio</i>	<i>T. tinca</i>	<i>A. boyeri</i>	
2001	60.300	50.200	500	1.205.100	0	0	1.316.100
2002	14.975	232.900	**	23.806	50	0	271.731
2003	3.800	31.825	**	12.200	1.850	0	49.675
2004	6.050	3.950	800	7.050	1.470	0	19.320
2005	2.550	4.500	800	344.800	110	0	352.760
2006	*	1.200	**	54.453	**	25.533	81.186

\* Prohibition of catching of the species, \*\* Low quantity

minished). With this aim between 1990-1994 *Carassius gibelio* (Bloach, 1782) a kind of fish; in 1996 *Tinca tinca* Linnaeus; in 2000 *Chalcalburnus calcooides* Guldensteadt, 1772; in 2003 *Atherina boyeri* Risso, 1810 were left in the lake without control. Now with two kinds are extinct, there are living 15 fish species in total in the lake. Six of them (40%) are added afterwards (Table 6).

In recent years both fish species caught, and their difference in their quality (Table 7) has caused pessimism among fisherman and scientist.

## Conclusion

Because of global warming, there are many problems which are mainly changing the level of water and dried parts in many lakes and rivers. Lentic ecosystem, provide many advantages to the people living there such as using water consisting suitable microclimatological factors, the fishing. Egirdir lake is used for drinking watering and using water for lands besides it is plentifully for fishing.

Until 1955's although there are nine kinds of fish species in lake ecosystem. Egirdir lake takes the period in which dramatically and irreversible due to being left pike perch in Lake Egirdir. Being eaten little fish by this fish. It is aimed that pike perch becomes more fertile crop that is firstly pleased. In this period both productive fishing from high fruitful crop and pike perch moreover exportation of the fish to European

countries, which is raised the level of prosperity in this region. In these years, because pike perch's suffering from food natural endemic fish in the lake where there are kind of fish such as *H.kemali* and *P.handlirschi* are extinct (Ozen, 1990). Thus this event leads to some kinds of fish are turned in to critical endangered (CR).

The people living in there realized this devastation of ecology in 1990's years. While in the past people got higher income, but now, there are fewer fishing and less fruitful in the lake.

Pike perch's living in pelagic region of profound lakes except fry periods. They feed with fish as a predator. Because of this, especially they have an important role about fishing the dam lakes (Alpbaz and Hossucu, 1988; Celikkale, 1988; Ozyurt and Avsar, 2002). In these lakes pike perch is raised. At first this fish is fertile, but later deteriorate of its yield and developments and some fish in ecosystem are being Extinct (EX), some of fish are being Critical Endangered (CR). Result of this we can explain this situation; the lake is shallow. This event prevented that fish's natural places where they can kinder, and not being predator fish and predator fish ad to share the same place.

People are used to getting high incomes about pike perch fishing, because of this unexpected problem, they try to new finds. They started to leave the fish which are uncontrolled, in to lake by trying. From these fish which live in ponds but adapted the lake *C. gibelio* in 2001 they were caught increasingly (Table 7). The

fishermen were pleased with this situation. But, due to this kind of fishes being too small and its favor tasty, they were marked cheaply, thus, the fishermen can try to find some new findings.

A *boyeri* which were acquaint to left to the lake in 2003, is second range among catching fishes (Table 6). But later it is estimated that it will be more densely.

In the lake, reducing the kind of fish to be controlled the vegetation covering the coast with water plants (especially *Phragmites* spp.) and appearing the small islands in the lake lead to restrict the lake's abounding in the water place.

As a result, in the years of 1955, pike perch are left in the lake owing to getting more qualified harvest. Because of this, Egirdir Lake started to devastation and it continues at present. Therefore the lake resembles an aquarium which is uncontrolled and it is interfered unconsciously.

## References

- Alpbaz, H. and H. Hossucu**, 1988. Icsu Balıkları Yetistiriciligi. *Ege Univ. Yay.*, İzmir, **12**: p. 222.
- Anonim**, 2007. Egirdir Golu Yonetim Planı Calistayi. T.C. Isparta Valiligi II Cevre ve Orman Mudurlugu. 22. Mayıs.2007. ISPARTA
- Bildiren, A.**, 1991, Egirdir Golu Kopru Avlagi Bentik Faunasi Uzerinde Bir Arastirma. Yuksek Lisans Tezi, Akdeniz Univ.Fen Bil. Enst. Isparta. p. 109.
- Bolat, Y., O. Diler, A. Diler and I. Diler**, 2007. Protection and control strategies together with the changes in catchable stock and crayfish fishing in Egirdir Lake-Turkiye. I<sup>st</sup>. Symposium for Protection of Natural Lakes in Republic of Macedonia. Hidrobiological Institute Ohrid. 31.05-03.06.2007.
- Celikkale, M. S.**, 1988. Icsu Balıkları ve Yetistiriciligi. Karadeniz Teknik Univ. Genel Yay. No: 124, Fak.Yay. No. 2 Trabzon. p. 419.
- Cubuk, H., I. Balik, S. Cinar, R. Ozkok, L. Tumgelir, R. Kucukara, K. G. Erol, R. Uysal and M. Yagci**, 2007. Egirdir Golu Balıkçiliginda Son Durum. *Turkish Journal of Aquatic Life*, **3-5** (5-8): 182-188.
- Ertan, O.O., I Gulle, I. I. Turna and S. Savas**, 2001. Dunden bugune Egirdir Golu. I. Egirdir Sempozyumu. 31.08-01.09. 2001. Egirdir – Isparta, pp. 295-300.
- Geldiay, R.**, 1984. Egirdir Golunun tarihi Gelisimi ve produktivitesi. Akd.Univ. II. Muh.Haf. 23-26. Mayıs 1984. Isparta. Pp. 222-229.
- Ikiz, R. and E. Kesici**, 1997. Lake Egirdir. Conservation and Management of Lakes, Reservoirs and Wetlands in Turkey. International Lake Environment Committee Foundation. *Report Submitted to the Environment Agency*, Government of Japan. March 1997, pp. 79-100.
- Kucuk, F., I. Gulle, S. S. Guclu, E. Gumus and O. Demir**, 2006. Egirdir Golune Sonradan Giren Gumus baligi (*Atherina boyeri* Risso, 1810)'nin Gol Ekosistemine ve Balıkçiliga Etkisi. Ulusal Balıkçiligi ve Rezervuar Yonetimi Sempozyumu, 7-9 Febrier 2006 Antalya, pp. 119-128.
- Kucuk, F., H. M. Sari, O. Demir and I. Gulle**, 2007. Egirdir Golu Balık Faunasinin Degisim Sureci : 1915-2007. Goller Yoresi Ic Anadolu Golleri ve Sorunlari : Goller Kongresi. 09-10.Haziran.2007. Isparta.
- Numann, W.**, 1958. Anadolunun Muhtelif gollerinde limnolojik ve balıkçilik ilmi bakimindan arastirmalar ve bu gollerde yasayan sazanlar hakkında Ozel bir etud. Ist.Univ. Fen Fak. *Hidrobiol.Ars.Enst. Sayi*, **7**: p. 114.
- Ozen, M. R.**, 1995. *Alburnus orontis* ve *Phoxinellus handlirschi* Balıklarının Yapay Uretimi ve Embriyolojik Gelisimi Uzerinde Bir Arastirma. Doktora Tezi. Suleyman Demirel Univ. Fen Bil. Enst. Su Urun.Muh. Anabilim Dali. Isparta. p. 93.
- Ozyurt, C. E. and D. Avsar**, 2002. Seyhan Baraj Golundeki (Adana) Sudakların (*Sander lucioperca* Bogutskaya&Naseka, 1996) Bazi Biyolojik Ozelliklerinin Belirlenmesi. *Ege Univ.Su Ur.Derg.*, **19** (1-2): 77-84.
- Timur, M., O. Ozkutuk, I. Turna and H. Kucuktas**, 1986. A Study of the flora in the Fishing grounds of Lake Egirdir and the effects of fish productivity. *The Journal of Firat Univ.*, **1**(1): 113-125.
- Petr, T.**, 1984. Draft Report on Freshwater Inland Fisheries in Turkey. FAO. *Fisheries Travel Report and Aide Memo-ries* No: 2455, p. 54.

Received February, 20, 2008; accepted for printing March, 15, 2008.