

## On the Fish Fauna of Lake İznik (Turkey)

Müfit ÖZULUĞ, Ömer ALTUN\*, Nurettin MERİÇ  
İstanbul University, Science Faculty, Department of Biology, 34134 İstanbul - TURKEY

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**Abstract:** Lake İznik, which is under the threat of pollution, has been subject to a very limited number of studies in terms of its fish fauna, and therefore the species living in the lake are not well known yet.

It was demonstrated that 19 fish species inhabit Lake İznik: *Alburnus alburnus* (Linnaeus, 1758), *Alburnus chalcoides* (Güldenstadt, 1772), *Barbus tauricus escherichi* Steindachner, 1897, *Capoeta tinca* (Heckel, 1843), *Carassius gibelio* (Bloch, 1782), *Cyprinus carpio* Linnaeus, 1758, *Leuciscus cephalus* (Linnaeus, 1758), *Rutilus frisii* (Nordmann, 1840), *Rutilus rutilus* (Linnaeus, 1758), *Vimba vimba* (Linnaeus, 1758), *Tinca tinca* (Linnaeus, 1758), *Cobitis vardarensis* Karaman, 1928, *Nemacheilus angorae* Steindachner, 1897, *Silurus glanis* Linnaeus, 1758, *Atherina boyeri* Risso, 1810, *Gambusia holbrooki* Girard, 1859, *Gasterosteus aculeatus* Linnaeus, 1758, *Salaria fluviatilis* (Asso, 1801) and *Proterorhinus marmoratus* (Pallas, 1814). *B. t. escherichi*, *C. tinca*, *C. gibelio*, *T. tinca* and *G. holbrooki* were recorded for the first time from the lake. The diagnostic characteristics of these 5 species and *Rutilus rutilus* were studied and are given in detail.

**Key Words:** Fauna, Fish, First records, Lake, İznik, Turkey.

### İznik Gölü (Türkiye) Balık Faunası Hakkında

**Özet:** Kirlilik tehdidi altında bulunan İznik Gölü, balık faunası bakımından bugüne kadar az sayıda çalışmaya konu olmuştur ve gölde yaşayan balık türleri tam olarak bilinmemektedir.

Gölde, *Alburnus alburnus* (Linnaeus, 1758), *Alburnus chalcoides* (Güldenstadt, 1772), *Barbus tauricus escherichi* Steindachner, 1897, *Capoeta tinca* (Heckel, 1843), *Carassius gibelio* (Bloch, 1782), *Cyprinus carpio* Linnaeus, 1758, *Leuciscus cephalus* (Linnaeus, 1758), *Rutilus frisii* (Nordmann, 1840), *Rutilus rutilus* (Linnaeus, 1758), *Vimba vimba* (Linnaeus, 1758), *Tinca tinca* (Linnaeus, 1758), *Cobitis vardarensis* Karaman, 1928, *Nemacheilus angorae* Steindachner, 1897, *Silurus glanis* Linnaeus, 1758, *Atherina boyeri* Risso, 1810, *Gambusia holbrooki* Girard, 1859, *Gasterosteus aculeatus* Linnaeus, 1758, *Salaria fluviatilis* (Asso, 1801) ve *Proterorhinus marmoratus* (Pallas, 1814) olmak üzere, toplam 19 balık türünün bulunduğu saptanmıştır.

*B. t. escherichi*, *C. tinca*, *C. gibelio*, *T. tinca* ve *G. holbrooki* İznik Gölü'nden ilk kez elde edilmiş ve bu 5 tür ile *Rutilus rutilus*'un diyagnostik karakterleri ayrıntılı biçimde verilmiştir.

**Anahtar Sözcükler:** Fauna, Balık, İlk kayıt, İznik Gölü, Türkiye

### Introduction

Lake İznik is located in Bursa province, between the towns of Orhangazi and İznik (40°23' to 40°30' N; 29°30' to 29°42' E), at an altitude of 80 m (Figure). It is a tectonic lake. With an area of 313 km<sup>2</sup>, it is the fifth largest lake in Turkey. Its depth is 73 m at its deepest point (İnadık, 1965; Franz et al., 2003). It has 1 outlet, Karsak stream, and 5 inlets, Orhangazi, Kuru, Karasu, Ekinlik and Sölöz streams. Karsak stream connects the lake to the Sea of Marmara but it has a number of natural

and artificial barriers that marine fishes are unable to cross.

To date, the fish fauna of Lake İznik has not been directly studied. It was only referred to in some of the freshwater studies carried out in Turkey by Kosswig (1939), Battalgil (1941), Sözer (1941), Kosswig and Battalgil (1943), Nümann (1958), Ladiges (1960), Balık (1979), Geldiay and Balık (1996), Altun (1999) and Erkakan et al. (1999).

\*Corresponding author: altuno@excite.com

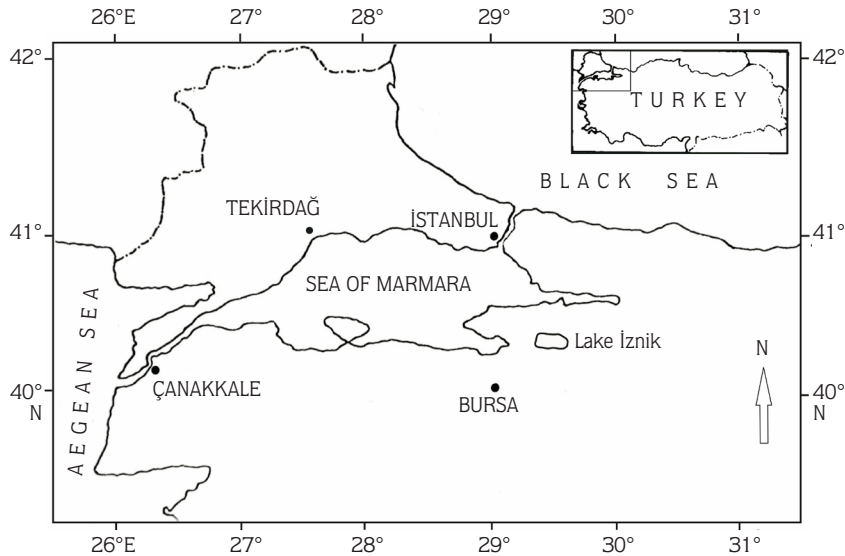


Figure. Location of Lake İznik in Turkey.

In recent years, the lake has been increasingly polluted as a result of rapid industrialisation, population growth, unplanned settlement and intensive agricultural activities in the periphery (Aktan and Aykulu, 2001).

The present study aimed to determine the latest status of the fish fauna in the lake, which is, at present, under the threat of heavy pollution.

### Materials and Methods

The study material was sampled from Lake İznik from 1996 to 2003. The fish were caught using 2 gill nets with mesh sizes of 9 x 9 mm and 12 x 12 mm, trammel nets with various mesh sizes, cast nets, scoop nets, and electrofishing (WFC911 portable electric fishing machine). The samples were fixed and preserved in a 5% formaldehyde solution. The standard length and body depth were measured by compasses and a fish measuring board. Of the meristic characteristics, gill rakers, pharyngeal teeth, dorsal and anal fin rays, lateral line scales and vertebrae were counted. Vertebral counts include 4 Weberian centra and the urostyle as an ultimate vertebra. Various sources (Berg, 1949a, 1949b; Banarescu, 1964; Ladiges and Vogt, 1965; Tortonese, 1975; Banister, 1986; Rauchenberger, 1989; Altun, 1991, 1999; Geldiay and Balik, 1996; Eschmeyer, 1998;

Erkakan et al., 1999) were referred to for the determination and definition of the genera and species of the fish samples.

### Results

Nineteen fish species were defined in Lake İznik, as listed in the Table. Of these species, the presence of *Barbus tauricus escherichi* (Steindachner, 1897), *Capoeta tinca* (Heckel, 1843), *Carassius gibelio* (Bloch, 1782), *Tinca tinca* (Linnaeus, 1758) and *Gambusia holbrooki* Girard, 1859 was recorded in Lake İznik for the first time in the present study.

#### Morphology of Some Fish Species from Lake İznik

##### *Barbus tauricus escherichi* Steindachner, 1897

**Material examined:** 29 June 2001, 2 specimens. Length: 63-76 mm SL.

**Diagnostic characteristics:** 12-13 gill-rakers on the first branchial arch; pharyngeal teeth, triserial, 2.3.5-5.3.2; dorsal fin rays IV, 8; anal fin rays III, 5; lateral line scales 54-60. Colour: Dorsal, dark olive green; flank and belly yellowish-brown; dark speckles on body, dorsal and anal fins.

Table. List of fish species from Lake İznik.

Family	Species
Cyprinidae	<i>Alburnus alburnus</i> (Linnaeus, 1758)
	<i>Alburnus chalcoides</i> (Güldenstadt, 1772)
	<i>Barbus tauricus escherichi</i> Steindachner, 1897
	<i>Capoeta tinca</i> (Heckel, 1843)
	<i>Carassius gibelio</i> (Bloch, 1782)*
	<i>Cyprinus carpio</i> Linnaeus, 1758
	<i>Leuciscus cephalus</i> (Linnaeus, 1758)
	<i>Rutilus frisii</i> (Nordmann, 1840)
	<i>Rutilus rutilus</i> (Linnaeus, 1758)
	<i>Vimba vimba</i> (Linnaeus, 1758)
<i>Tinca tinca</i> (Linnaeus, 1758)	
Cobitidae	<i>Cobitis vardarensis</i> Karaman, 1928
Balitoridae	<i>Nemacheilus angorae</i> Steindachner, 1897
Siluridae	<i>Silurus glanis</i> Linnaeus, 1758
Atherinidae	<i>Atherina boyeri</i> Risso, 1810*
Poeciliidae	<i>Gambusia holbrooki</i> Girard, 1859*
Gasterosteidae	<i>Gasterosteus aculeatus</i> Linnaeus, 1758
Blenniidae	<i>Salaria fluviatilis</i> (Asso, 1801)
Gobiidae	<i>Proterorhinus marmoratus</i> (Pallas, 1814)

\* Introduced species

#### *Capoeta tinca* (Heckel, 1843)

**Material examined:** 13 October 1996, 2 specimens; 14 December 1996, 2 specimens; 17 May 1997, 4 specimens; 29 June 2001, 5 specimens. Length: 66-213 mm SL.

**Diagnostic characteristics:** 19-21 gill-rakers on the first branchial arch; pharyngeal teeth, triserial, 2.3.4-4.3.2 and their crowns spatulate; dorsal fin III-IV, 7-8; anal fin II-III, 5; lateral line scales 68-81. Colour: Dorsal area dark brown, flank and belly yellowish; peritoneum black.

#### *Carassius gibelio* (Bloch, 1782)

**Material examined:** 17 November 2003, 7 specimens; Length: 168-236 mm SL.

**Diagnostic characteristics:** 45-50 gill-rakers on the first branchial arch; pharyngeal teeth, uniserial, 4-4; upper margin of dorsal fin slightly concave; dorsal fin III-IV, 15-18; anal fin III, 5; lateral line scales 29-31. Colour: Dorsal lead coloured, flank dark silvery, fins dark and peritoneum black.

#### *Rutilus rutilus* (Linnaeus, 1758)

*Rutilus rubilio* (non Bonaparte, 1873): Battalgil (1941): 173; Kosswig and Battalgil (1943): 21; Nümann (1958): 39; Ladiges (1960): 128; Geldiay and Balık (1996): 345.

*Rutilus rutilus* (Linnaeus, 1758): Bogutskaya (1997): 178-179.

**Material examined:** 13 October 1996, 3 specimens; 14 December 1996, 1 specimen; 17 May 1997, 11 specimens; 11 October 1997, 3 specimens. Length: 122-234 mm SL.

**Diagnostic characteristics:** 11-16 gill-rakers on the first branchial arch; pharyngeal teeth, uniserial, 6-5 or 6-6; dorsal fin IV, 9-10; anal fin III-IV, 9-12; lateral line scales, 43-47; vertebrae 39-43. Colour: Dorsal grey, flank silver; iris, red; pectoral, pelvic and anal fins, orange.

#### *Tinca tinca* (Linnaeus, 1758)

**Material examined:** 13 October 1996, 18 specimens; 17 May 1997, 7 specimens. Length: 99-195 mm SL.

**Diagnostic characteristics:** 13-17 gill-rakers on the first branchial arch; pharyngeal teeth, uniserial, 4-5, 5-4 or 4-4; dorsal fin III-IV, 8-9; anal fin III-IV, 6-7; lateral line scales, 101-111. Colour: Dorsal dark green, flank light green and belly greenish-yellow.

#### *Gambusia holbrooki* Girard, 1859

**Material examined:** 29 June 2001, 6 specimens. Length: 17-43 mm SL.

**Diagnostic characteristics:** Dorsal fin I-II, 5-6; anal fin rays in the female III, 7; posterior edge of the joins of the first elongate anal fin ray in the males distinctly serrated; lateral line scales 31-34. Colour: Body light greyish-brown; small speckles on body, dorsal and anal fins.

#### Discussion

Although Lake İznik is the fifth largest lake in Turkey, its fish fauna has been rarely studied in detail. The present study, which aimed to fill this gap, demonstrated the presence of 19 fish species, 5 of which were recorded for the first time.

Of the fish species from Lake İznik, *A. boyeri*, *G. aculeatus* and *S. fluviatilis* are Mediterranean, while *P. marmoratus* and *R. frisii* are Ponto-Caspian in origin (Kosswig, 1939). *A. boyeri* is a species introduced into the lake. Its introduction time is unknown, and it was recorded in the lake for the first time by Altun (1991). Besides Lake İznik, *R. frisii* also inhabits Lake Durusu (Terkos), located 60 km north-west of İstanbul (Geldiay and Balık, 1996). However, *S. fluviatilis* is known only in Lake İznik, as a landlocked population in Turkey (Geldiay and Balık, 1996). *C. gibelio* is another species introduced into Lake İznik.

This species is distinguished from *C. carassius* in Europe by a golden-brown, silvery body colour (vs. golden-green shining colour); the last simple anal and dorsal rays are strongly serrated (vs. weakly serrated); and the other characters are 39-50 gill rakers (vs. 23-35), 28-31 total lateral line scales (vs. 32-35), a free edge of the dorsal fin convex or straight (vs. concave), usually 5 branched anal rays (vs. usually 6), and a black peritoneum (vs. whitish) (Özuluğ et al., 2004).

We encountered it in 2003. However, it has been infrequently caught since 2001, according to the local commercial fishermen.

In the present study, 2 samples of *Barbus* Cuvier, 1817, which were obtained for the first time from Karasu stream which runs into Lake İznik, were similar to the definitions provided for *Barbus plebejus escherichi* Steindachner, 1897 by Geldiay and Balık (1996). However, in Kottelat (1997), based on the definitions of Geldiay and Balık (1996), *B. p. escherichi* was clearly described as a synonym of *Barbus cyclolepis* Heckel, 1837. This synonymy was later questioned by Eschmeyer (1998). Eschmeyer (1998), just like Berg (1949a), included the subspecies *escherichi* in the species *Barbus tauricus* Kessler 1877. Therefore, our samples should also be taken into consideration as *B. t. escherichi*.

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In a study by Bogutskaya (1997) on the fish caught from Lake İznik and called *R. rubilio* by Kosswig and Battalgil (1943) and Ladiges (1960), it was concluded that the fish were actually *R. rutilus*. Our samples were in compliance with the meristic characteristics, particularly in the vertebral counts, given by both Geldiay and Balık (1996) and Bogutskaya (1997) for *R. rutilus*, while they were definitely more diverse than the numbers of vertebrae (respectively 36-37 and 34-37) given by Tortonese (1970) and Crivelli and Dupont (1987) for *R. rubilio*.

In the present study, what helped in the determination of the *G. holbrooki* caught for the first time was that the posterior edge of the joints of the first elongate anal fin ray in the males was distinctly serrated, as proposed by Berg (1949b) and Rauchenberger (1989). These specific characteristic was also pointed out in the studies by Tortonese (1970) and Spillmann (1961). These teeth are absent in *Gambusia affinis*. However, in studies so far carried out in Turkish waters, only *G. affinis* (Baird and Girard, 1853) has been reported in several different regions (Meriç, 1992; Geldiay and Balık, 1996; Kuru, 1996; Özuluğ and Meriç, 1997; Özuluğ, 1999), but the specific characteristic that definitely distinguishes it from *G. holbrooki* has never been mentioned. This clearly indicates that a taxonomic revision is required for *Gambusia* species living in Turkish waters.

Even though *Petroleuciscus borysthenicus* (Kessler, 1859), which was reported by Battalgil (1940, 1942) and Kosswig and Battalgil (1943), and *Coregonus macrophthalmus* Nüsslin, 1882, introduced into the lake by Nümann (1954), were specifically monitored, no samples were seen during our study in the basin of Lake İznik.

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