The fish fauna of the Durusu Lake Basin (İstanbul-Turkey)

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Abstract

This study was carried out to determine the fish fauna of Durusu Lake Basin. 27 fish species belonging to 10 families were determined. *Clupeonella cultriventris, Barbus cyclolepis, Atherina boyeri, Gambusia holbrooki, Syngnathus abaster, Knipowitschia caucasica, Neogobius* cf. *eurycephalus* were recorded for the first time from the lake basin.

Keywords: Fish fauna, Durusu Lake, First record.
Abbreviations: Standard length: SL, fork length: FL, total length: TL, head length: hl, interorbital distance: io, locality: loc, examples: ex, Istanbul University Science Faculty Hydrobiology Museum: IUSHM.

Introduction

Turkey is an extremely interesting region faunistically and zoogeographically being situated at the junction of three big regions, Holoarctic, Sinoindian and African (Bogutskaya 1992). The first studies on freshwater fish fauna of Turkey started in the mid-1800s (Kuru 2004).

There has not been a detailed research about the fish species of Lake Durusu, but older studies by Devedjian (1926); Battalgil (1941); Kosswig and Battalgil (1943); Ladiges (1960); Balık (1985); Geldiay and Balık (1996) mention some species present in the lake.

There have been important changes in water quality of Lake Durusu up today. During the drought in 1995, the depth of the lake dropped to 1.5 m and salty water from Black Sea was pumped to the lake from the canal. After 1995 water stored in 7 dams out of the lake's catchment area located on Yıldız (Istıranca) Mountains was employed to feed the lake with large quantities of fresh water.

The present study aimed to determine the latest status of the fish fauna in the lake.

Material and Methods

Lake Durusu is located on Northwestern Istanbul near the coasts of the Black Sea and is 60 km away from the city center. Lake's main sources of water are two streams named Yıldız (Istıranca) and Çiftlikköy. The natural depth of the lake was 5 m until the mouth of the Yıldız stream flowing to the Black Sea just near the lake was closed with a regulator in 1883 supply Istanbul with water. There is a canal named Darboğaz located between the sea and the lake with a length of 3.5 km and 15-30 m of depth approximately, however the lake's connection to the sea is obstructed by a sand barrier. In stormy weather seawater can pass the sand barrier and enter the canal.

Fish specimens were captured from 8 stations seen on the map on Fig. 1 between May 2000 and December 2002. Samplings from different areas of the Lake were not named distinctively and named as station 7. Different sizes of gill nets with 9x9 mm, 12x12 mm, 18x18 mm, 22x22 mm, 26x26 mm, 30x30 mm and 34x34 mm of mesh diameters were employed for capturing specimens besides a trammel net, a cast net, a long handled scoop net and a portable electroshock device

(Elektracatch, WFC911). Specimens were fixed in 5% formaldehyde solution and preserved in 70% ethyl alcohol. Gill rakers are counted on the first gill arch. The last two branched rays articulating on a single pterygiophore in the dorsal and anal fins were noted as "1½". Measurements were taken using a millimetric scale board and a compass. Meristic counts were made under binocular dissection microscope. During the analysis of the fish, the taxonomic order suggested by Nelson (1994) was used, and the names of species were attributed following Eschmeyer (1998). Seldom acquired values were given in parenthesis. Voucher specimens are deposited in Istanbul University Science Faculty Hydrobiology Museum (IUSHM).

Figure 1. Sampling stations from the catchment area of Lake Durusu

Results

A total of 27 fish species belonging to 10 families were identified and are listed below. Data on minimum and maximum total length, the dates on which work was done at the stations, locations and the diagnostic characteristic are given.

Familia:Clupeidae

Clupeonella cultriventris (Nordmann, 1840)

Material examined: (Loc.7) Lake Durusu: 26 October 2000, 3 ex.; 06 June 2001, 12 ex.; 22 August 2001, 5 ex.; (Loc.8) Darboğaz: 22 June 2002, 4 ex. Length: 48-87 mm FL, 24 ex.

Diagnostic characteristic: D III-IV/11-13; P I/(11)12-14; V II/(6)7; A II-III (12-13)14-17; hl/FL: 22.22-26.53% average 24.18%; io/hl: 15.59-22.22% average 19.55%; gill rakers 44-54.

Familia:Cyprinidae

Abramis brama (Linnaeus, 1758)

Material examined: (Loc.7) Lake Durusu: 26 October 2000, 3 ex.; 21 November 2000, 3 ex.; 19 December 2000, 3 ex.; 21 February 2001, 12 ex.; 21 March 2001, 5 ex.; (Loc.8) Darboğaz: 22 June 2002, 3 ex. Length: 251-415 mm TL, 29 ex.

Diagnostic characteristic: D III-IV/8-9½; P I/(14-15)16-17; A III/(21)23-26½; lateral line scales 49-56; gill rakers 24-28; pharyngeal teeth 5-5.

Barbus cyclolepis Heckel, 1837

Material examined: (Loc.1) Yıldız stream: 24 July 2001, 4 ex.; (Loc.4) Yıldız stream: 24 July 2001, 5 ex.; (Loc.6) Çiftlikköy stream: 24 July 2001, 4 ex. Length: 28-203 mm TL, 13 ex.

Diagnostic characteristic: DIII-IV/7-8½; P I/(14)15-16(17); A III/5½; lateral line scales 66-74; gill rakers 7-10; pharyngeal teeth 2.3.5-5.3.2. Outer margin of dorsal fin is truncated seldomly slightly concave and 2/3part of last unbranched ray denticulated. Back dark olive green; flanks and belly yellowish light brown. Pectoral and pelvic fins more reddish yellow. Dorsal, anal and caudal fins and body with little or big dark speckles.

Carassius carassius (Linnaeus, 1758)

Material examined: (Loc.7) Lake Durusu: 28 May 2000, 3 ex.; 28 August 2001, 1 ex. Length: 96-187 mm TL, 4 ex.

Diagnostic characteristic: D III/16½; P/I 14-15; A III/6-7½; lateral line scales 33-34; gill rakers 30-32; pharyngeal teeth 4-4. Outer margin of dorsal fin is convex.

Alburnus istanbulensis Battalgil, 1941

Material examined: (Loc.3) Yıldız stream: 24 July 2001, 1 ex.; (Loc.7) Lake Durusu: 26 October 2000, 6 ex.; 06 June 2001, 3 ex.; 15 July 2001, 4 ex.; 22 June 2002, 4 ex.; (Loc.8) Darboğaz: 22 June 2002, 4 ex. Length: 85-226 mm TL, 22 ex.

Diagnostic characteristic: DIII/8-9½; P I/14-17; A III/14-16½; lateral line scales 57-68; gill rakers 29-36; pharyngeal teeth, 2.5-5.2; anal-fin origin ½-1½ scales behind dorsal-fin base; ventral keel exposed for 7-12 scales in front of anus.

Cyprinus carpio Linnaeus, 1758

Material examined: (Loc.7) Lake Durusu: 26 October 2000, 5 ex.; 06 June 2001, 1 ex. Length: 190-390 mm TL, 6 ex.

Diagnostic characteristic: D IV/18-21½; P/I 15-16; A III/5½; lateral line scales 37-39; gill rakers 23-27; pharyngeal teeth 1.1.3-3.1.1.

Petroleuciscus borysthenicus (Kessler, 1859)

Material examined: (Loc.3) Yıldız stream: 24 July 2001, 1 ex.; (Loc.4) Yıldız stream: 24 July 2001, 3 ex.; (Loc.6) Çiftlikköy stream: 24 July 2001, 2 ex.; (Loc.7) Lake Durusu: 01 May 2001, 2 ex.; 06 June 2001, 5 ex.; 28 August 2001, 1 ex.; (Loc.8) Darboğaz: 22 June 2002, 4 ex. Length: 66-134 mm TL, 18 ex.

Diagnostic characteristic: D III 8½; P I 3-16; A III 9-10½; lateral line scales 37-40(41), gill rakers (7)8-10; pharyngeal teeth 2.5-5.2.

Squalius cephalus (Linnaeus, 1758)

Material examined: (Loc.1) Yıldız stream: 24 July 2001, 1 ex.; (Loc.2) Yıldız stream: 20 September 2000, 4 ex. Length: 71-115 mm TL, 5 ex.

Diagnostic characteristic: D III/8½; P I/15-16; A III/8½; lateral line scales 44-47; gill rakers 9; pharyngeal teeth 2.5-5.2.

Rhodeus amarus (Bloch, 1782)

Material examined: (Loc.2) Yıldız stream: 20 September 2000, 4 ex.; (Loc.3) Yıldız stream: 24 July 2001, 4 ex.; (Loc.4) Yıldız stream: 24 July 2001, 1 ex.; (Loc.5) Çiftlikköy stream: 24 July 2001, 2 ex.; (Loc.6) Çiftlikköy stream: 24 July 2001, 2 ex.; (Loc.7) Lake Durusu: 23 October 2000, 4 ex.; 26 October 2000, 6 ex.; 6 June 2001, 4 ex.; (Loc.8) Darboğaz: 22 June 2002, 4 ex. Length: 41-79 mm TL, 31 ex.

Diagnostic characteristic: D III/9-10½; P I/(9)10-12; A III/8-10½; lateral line incomplete lateral line scales (3)4-6(7); lateral series scales 36-39; gill rakers (10)11-14; pharyngeal teeth 5-5.

Rutilus frisii (Nordmann,1840)

Material examined: (Loc.7) Lake Durusu: 21 November 2000, 11 ex.; 19 December 2000, 2 ex.; 21 March 2001, 1 ex.; 26 May 2001, 2 ex. Length: 150-375 mm TL, 16 ex.

Diagnostic characteristic: D III-IV/9-10½; P I/17-19; A III-IV/10-11½; lateral line scales 59-64(69); gill rakers 8-11; pharyngeal teeth (5)6-5(6).

Scardinius erythrophthalmus (Linnaeus, 1758)
Material examined: (Loc.7) Lake Durusu: 26 October 2000, 12 ex.; 21 November 2000, 13 ex.; (Loc.8) Darboğaz: 22 June 2002, 5 ex. Length: 134-247 mm TL, 30 ex.
Diagnostic characteristic: D III/8-9½; P I/14-17; A III/10-12½; lateral line scales 39-43; gill rakers 10-13; pharyngeal teeth 3.5-5.3.

Tinca tinca (Linnaeus, 1758)
Material examined: (Loc.7) Lake Durusu: 26 October 2000, 1 ex.; 21 November 2000, 1 ex.; 21 February 2001, 1 ex.; 06 June 2001, 4 ex.; 15 July 2001, 7 ex.; 28 August 2001, 2 ex. Length: 170-314 mm TL, 16 ex.
Diagnostic characteristic: D III-V/8-9½; P I/16-18; A III-IV/6-7½; lateral line scales 92-105; gill rakers 12-16; pharyngeal teeth (5)4-5(4).

Vimba vimba (Linnaeus, 1758)
Material examined: (Loc.7) Lake Durusu: 26 October 2000, 1 ex.; 26 May 2001, 5 ex.; 06 June 2001, 1 ex.; 22 June 2002, 3 ex.; (Loc.8) Darboğaz: 22 June 2002, 2 ex. Length: 76-234 mm TL, 12 ex.
Diagnostic characteristic: D III/7-9½; P I/14-17; A III/15-18½; lateral line scales 51-57; gill rakers 18-21; pharyngeal teeth 5-5.

Familia:Cobitidae
Cobitis vardarensis Karaman, 1928
Material examined: (Loc.5) Çiftlikköy Stream: 24 July 2001, 1 ex.; (Loc.6) Çiftlikköy Stream: 24 July 2001, 1 ex.; (Loc.7) Lake Durusu: 18 September 2001, 3 ex.; 22 June 2002, 4 ex. Length: 51-86 mm TL, 9 ex.
Diagnostic characteristic: Males with single lamina circularis at the base of second pectoral ray. D III/6-7; P I/7-8; A III/5.

Familia:Siluridae
Silurus glanis Linnaeus, 1758
Material examined: (Loc.7) Lake Durusu: 26 October 2000, 1 ex.; 15 July 2001, 1 ex. Length: 323-352 mm TL, 2 ex.
Diagnostic characteristic: D IV; P I/14; V 12-13; A 82-85.

Familia:Esocidae
Esox lucius Linnaeus, 1758
Material examined: (Loc.7) Lake Durusu: 26 October 2000, 2 ex.; 21 November 2000, 4 ex.; 19 December 2000, 13 ex.; 08 February 2001, 8 ex.; 21 March 2001, 11 ex.; (Loc.8) Darboğaz: 22 June 2002, 1 ex. Length: 325-600 mm TL, 39 ex.
Diagnostic characteristic: D VI-X/13-16; P I/(12)13-16; A V-IX/11-13(15); lateral line scales 118-138.

Familia:Atherinidae
Atherina boyeri Risso, 1810
Material examined: (Loc.7) Lake Durusu: 06 June 2001, 3 ex.; 22 June 2002, 1ex. Length: 95-98 mm TL, 4 ex.
Diagnostic characteristic: D1 VII-VIII, D2 II/10-12; P I/11-13; A II/12-14; gill rakers 26-29; lateral series scales 46-48.

Familia:Poeciliidae
Gambusia holbrooki Girard, 1859
Material examined: (Loc.7) Lake Durusu: 28 August 2001, 5 ex.; 22 June 2002, 4 ex. Length: 32-49 mm TL, 9 ex.
Diagnostic characteristic: D I-II/5-6; P II-IV/8-10; A III/7; gill rakers 12-15; lateral series scales 30-32. Posterior edge of the joins of the first elongate anal fin ray in the males distinctly serrated.

Familia:Syngnathidae
Syngnathus abaster Risso, 1827
Material examined: (Loc.7) Lake Durusu: 23 October 2000, 2 ex.; 28 August 2001, 2 ex.; 18 September 2001, 3 ex. Length: 62-130 mm TL, 7 ex.
Diagnostic characteristic: Body rings 14-16, 7-9 rings below of dorsal fin, caudal rings 36-38. D 31-37; P 9-13.

Familia:Percidae
Sander lucioperca (Linnaeus, 1758)

Material examined: (Loc.7) Lake Durusu: 5 December 2002, 1 ex. Length: 481 mm TL, 1 ex.

Diagnostic characteristic: D1 XIV; D2/II, 21; P III/12; lateral line scales 87.

Familia:Gobiidae

Knipowitschia caucasica (Berg, 1916)

Material examined: (Loc.7) Lake Durusu: 28 August 2001, 3 ex. Length: 21-27 mm TL, 3 ex.

Diagnostic characteristic: Anterior oculoscapular canal reaches the interorbital region not to the nostrils. In the middle of the preopercular canal δ pore absent. D1 V-VI; D2 I/8-10; P 15-16; V I-10-I, A I/8-10.

Mesogobius batrachocephalus (Pallas, 1814)

Material examined: (Loc.7) Lake Durusu: 26 May 2001, 2 ex.; 22 June 2002, 2 ex. Length: 128-212 mm TL, 4 ex.

Diagnostic characteristic: Three rows below row *b*. D1 VI; D2 I/17-18; P 18-20; V I-10-I; A I/13-16; lateral series scales 73-75.

Neogobius* cf. *eurycephalus (Kessler, 1874)

Material examined: (Loc.7) Lake Durusu: 18 September 2001, 5 ex.; 22 June 2002, 1 ex. Length: 62-121 mm TL, 6 ex.

Diagnostic characteristic: Pelvic fin anterior membrane with large, angular lateral lobes, nape scales completely and cycloid. D1 VI; D2 I/17-18; P 18-20; V I-10-I; A I/12-15; lateral series scales 58-64.

Neogobius fluviatilis (Pallas, 1814)

Material examined: (Loc.7) Lake Durusu: 26 May 2001, 1 ex.; 22 June 2002, 1 ex.; (Loc.8) Darboğaz: 22 June 2002, 3 ex. Length: 45-135 mm TL, 5 ex.

Diagnostic characteristic: D1 VI; D2 I/14-16; P 16-19; V I-10-I; A I/12-13; lateral series scales 53-60.

Neogobius gymnotrachelus (Kessler, 1857)

Material examined: (Loc.2) Yıldız Stream: 20 September 2000, 2 ex.; (Loc.6) Çiftlikköy Stream: 24 July 2001, 5 ex. Length: 53-91 mm TL, 7 ex.

Diagnostic characteristic: Nape naked before level of preopercle; D1 VI; D2 I/15-16; P 16-18; VI-10-I; A I/12-14; lateral series scales 55-61.

Neogobius melanostomus (Pallas, 1814)

Material examined: (Loc.7) Lake Durusu: 26 October 2000, 2 ex.; 26 May 2001, 1 ex.; 06 June 2001, 3 ex.; 22 June 2002, 2 ex.; (Loc.8) Darboğaz: 22 June 2002, 1 ex. Length: 73-144 mm TL, 9 ex.

Diagnostic characteristic: D1 VI; D2 I/15; P 16-19; V I-10-I; A I/12-13; lateral series scales 49-53; D1 with rear proximal dark spot.

Proterorhinus marmoratus (Pallas, 1814)

Material examined: (Loc.3) Yıldız Stream: 24 July 2001, 1 ex.; (Loc.5) Çiftlikköy Stream: 24 July 2001, 1 ex.; (Loc.6) Çiftlikköy Stream: 24 July 2001, 1 ex.; (Loc.7) Lake Durusu: 23 October 2000, 2 ex.; 22 June 2002, 1 ex. Length: 35-58 mm TL, 6 ex.

Diagnostic characteristic: D1 VI; D2 I/15-17; P 14-16; V I-10-I; A I/12-14; lateral series scales 41-55; anterior nostril tubular, very elongate to beyond lips.

Discussion

Alburnus alburnus (Linnaeus 1758) formerly recorded from Lake Durusu by Balık (1985) and Geldiay and Balık (1996) and also *Perca fluviatilis* Linnaeus, 1758 recorded by Devedjian (1926) from Lake Durusu were not encountered in this research.

According to Geldiay and Balık (1996) and Karaman (1971), both mentioning the characteristics of the species of the *Barbus* genus in Turkey, only species living in the Thrace region (Northwest Turkey) is *Barbus plebejus escherichii* Steindachner, 1897. However there is not similarity between the values given for the subspecies *B. p. escherichii* (lateral line scales= 52-63; gill rakers= 8-13; outer margin of dorsal fin is concave) and the values for 13 individuals acquired in this research. Values of the specimens in this study similar to *B. p. cyclolepis* (lateral line scales= 61-76; gill rakers= 6-9; outer margin of dorsal

fin is straight seldomly slightly concave) given by Karaman (1971). *B. p. cyclolepis* was recorded and its diagnostic characteristics were given by Karaman (1971) as a subspecies, later it was accepted as a valid species *B. cyclolepis* by Kottelat (1997) and Eschmeyer (1998). *B. tauricus polylepis* Battalgil, 1941 was recorded from Keçesuyu-Eyüp near İstanbul in 1941 (lateral line scales=60-66) by (Battalgil 1941) and was accepted as the synonym of *B. cyclolepis* by Kottelat (1997) and Eschmeyer (1998). Therefore, with is research *B. cyclolepis* was recorded as the second from Thrace Region.

According to Özuluğ and Freyhof (2007), distrubution of *Alburnus istanbulensis* is restricted to coastal streams of Thrace from Karasu (Marmara Sea drainage) to Papuç (Black Sea drainage), and Lake Sapanca (Turkey). All metric and meristic characteristics of the specimens are similar to *A. istanbulensis*. Therefore specimens from Lake Durusu were identified, as *Alburnus istanbulensis.*

Rutilus frisii was recorded from Lake İznik and streams flowing to the Black Sea between Rize and Artvin (Geldiay and Balık 1996). This species living around Black Sea and Azak Sea basins migrate upward on riverbeds to reproduce (Slastenenko 1956). However dams built on this species' reproduction area endanger their population in North Black Sea (pers.comm. Jörg Freyhof). The population of this species in Lake Durusu should be preserved and hunting should be taken under control.

Only 4 individuals of *Atherina boyeri* were captured during the research. Individuals recorded in this research are probably entered to the lake when the dam doors are open. During our conversations with the dam workers was stated that after the release of the excess water from the dams, pike and carp were caught from the nearby Port of Karaburun and grey mullet were seen to be present in the lake.

According to Berg (1949) *Gambusia affinis* has 2 subspecies *Gambusia affinis affinis* (Baird&Girard, 1853) and *Gambusia affinis holbrooki* Girard, 1859. However Eschmeyer (1998) classified this sub species as *Gambusia affinis* and *Gambusia holbrooki*. The main distinctive characteristic of these species is the serrated proximal side of the elongated first ray of the male anal fin (Berg 1949). Serrated ray of the examined specimens were seen and the species identified as *Gambusia holbrooki*.

Bohlen and Rab (2001) observed the hybrids and species of genus *Cobitis* present in Europe elaborately. According to this study there are 23 *Cobitis* species in Europe and *Cobitis taenia* is present only in Northern Europe. Also according to Erkakan et al. (1999) there are 10 species of *Cobitis* in Turkey. Specimens from Lake Durusu were identified, as *Cobitis vardarensis*.

Examined *Knipowitschia caucasica* specimens did not had a visible posterior oculoscapular canal, after the observations made by Dr. Harald Ahnelt of 2 specimens sent to him he stated that the specimens are young individuals and did not fully developed these canals.

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