

The Ichthyofauna of Gediz River (Turkey): Taxonomic and Zoogeographic Features

Salim Serkan Güçlü^{1*} and Fahrettin Küçük¹

¹Faculty of Eğirdir Fisheries, Süleyman Demirel University, Eastern Campus, Isparta, Turkey.

Authors' contributions

This work was carried out in collaboration between all authors. Author SSG designed the study, wrote the protocol and interpreted the data. Authors SSG and FK anchored the field study, gathered the initial data and performed preliminary data analysis. Authors while SSG and FK managed the literature searches and produced the initial draft. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study was carried out to determine the fish fauna in the Gediz River and by comparing the fish fauna with that of neighboring basins from a zoogeographical point of view.

Place and Duration of Study: In order to establish the taxonomic and zoogeographic features of the fish fauna of the Gediz River Basin (Turkey), fish samples were collected using electrofishing equipment gill nets trammel nets, seine nets and cast nets from June 2010 to July 2012.

Methodology: The fish were collected using electrofishing equipment, gill nets (mesh size of 9x9 mm and 12x12 mm), trammel nets (various mesh size), seine nets (2 mm) and cast nets. The samples were fixed and preserved in a 4% formalin solution. Meristic characters such as number of gill rakers, pharyngeal teeth, dorsal and anal fin rays, total lateral line scales were counted under a stereomicroscope. The last two branched dorsal and anal fin rays are counted "1/2". The number of vertebrae in the Cyprinidae and Nemacheilidae was determined by radiography.

Results: Among the samples, 19 (Anguillidae (1), Cyprinidae (10), Siluridae (1), Nemacheilidae (1), Cobitidae (2), Poeciliidae (1), Gobiidae (1), Percidae (1) and Salmonidae (1)) species belonging to 9 families were identified. Determination of the species; *Alburnus battalgilae*, *Barbus pergamonensis*, *Luciobarbus lydianus*, *Capoeta bergamae*, *Squalius fellowesii*, *Chondrostoma*

*Corresponding author: E-mail: salimguclu@sdu.edu.tr;

holmwoodii, *Ladigesocypris mermere*, *Cobitis kurui*, *Cobitis fahireae*, *Oxynoemacheilus simavicus* and *Knipowitschia mermere* are endemic; *Gambusia holbrooki* and *Oncorhynchus mykiss* are non-native species.

Conclusion: As a result, in the Gediz River where there were 19 fish taxa, 44% of taxa were endemic. The endemic species on the basis of the IUCN criteria must be especially protected.

Keywords: *Anatolia; Gediz River; fish fauna; endemic; non-native.*

ABBREVIATIONS

SL: standard length (Standard length (SL) was measured from the tip of the upper lip to the end of the hypural complex); *D:* dorsal fin rays; *A:* anal fin rays; *P:* pectoral fin rays; *V:* pelvic fin rays; *C:* caudal fin rays.

1. INTRODUCTION

A recent review of the literature concerning the ichthyological research carried out in Anatolia since 1856 has shown that thus far 236 taxa, belonging to 26 families, have been reported from the inland waters of Turkey. In recent years, faunistic and taxonomic studies were conducted in various regions of Turkey. However, the taxonomy and classification of grades is not yet emphasized with certainty [1-14].

In Turkey's Aegean Region, Gediz River's length is second only to Büyük Menderes River the flow of which is roughly parallel at a distance of slightly more than a hundred kilometers to the south. River basin, day by day, due to intensive, rapid and excessive industrial, domestic and agricultural expansion, is contaminated.

Although upper basin of the river and estuarine areas related to the study have been investigated, there have not been studies on fish fauna covering the whole river basin. [2,15,16]. In this study, it was aimed to determine distribution of the fish species and fish fauna in the Gediz River.

2. MATERIALS AND METHODS

The Gediz River is the second-largest river in Anatolia flowing into the Aegean Sea. The ancient names Hermos and Hermus are sometimes still used. Gediz River rises from Murat Mountain and Şaphane Mountain in Kütahya Province and flows through Uşak, Manisa and İzmir Provinces. It joins the sea in the northern section of the Gulf of İzmir, close to the gulf's mouth, near the village of Maltepe in Menemen district, south of the coastal town of Foça [17] (Fig.1).

Length of the river is 401 km and stream catchment area of 17.500 km². The Gediz Delta is important as a nature reserve and is home to rare bird species. However, the reserve suffers from water shortages due to heavy demands from irrigation projects, connected to the Demirköprü Dam. High level of urbanization and industrialization along its basin also caused Gediz River to suffer severe pollution, particularly by sand and gravel quarries and leather industry. These factors contributed to the river's formerly rich fish reserves to become a thing of the past in recent years [17].

Fish samples were collected using electrofishing equipment (AC/DC 220/12V, 2 Hp portable electrical generator and with 2 circular 10 cm diameter electrodes), gill nets (mesh size of 9x9 mm and 12x12 mm), trammel nets (various mesh size), seine nets (2 mm) and cast nets from 2010 to 2012. 480 fish samples were caught. The samples were fixed and preserved in 4% formalin solution. Meristic characters such as number of gill rakers, pharyngeal teeth, dorsal and anal fin rays, total lateral line scales were counted under a stereomicroscope. The last two branched dorsal and anal fin rays are counted "1/2" [18]. The number of vertebrae in the Cyprinidae and Nemacheilidae was determined by radiography. The nomenclature used herein is based on the checklists of [19].

3. RESULTS

19 species belonging to 9 families (Anguillidae (1), Cyprinidae (10), Siluridae (1), Nemacheilidae (1), Cobitidae (2), Poeciliidae (1), Gobiidae (1), Percidae (1) ve Salmonidae (1)) were identified from the Gediz River samples (Table 1).

3.1 Family: Anguillidae

3.1.1 *Anguilla anguilla* (Linnaeus, 1758)

Material examined: Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 2 specimens, SL: 18-20 cm).

Diagnostic characters: D 241-260, A 178-196, P 17-18, C 9-11.

3.2 Family: Salmonidae

3.2.2 *Onchorynchus mykiss* (Walbaum, 1792) non-native (Fig. 2)

Material examined: Gümüşlü DSI pomp-Gediz-Kütahya (12.07.2010, 1 specimen, SL: 18.90 cm).

Diagnostic characters: D 11, A 12, C 20, gill rakers 17, vertebrae 64.

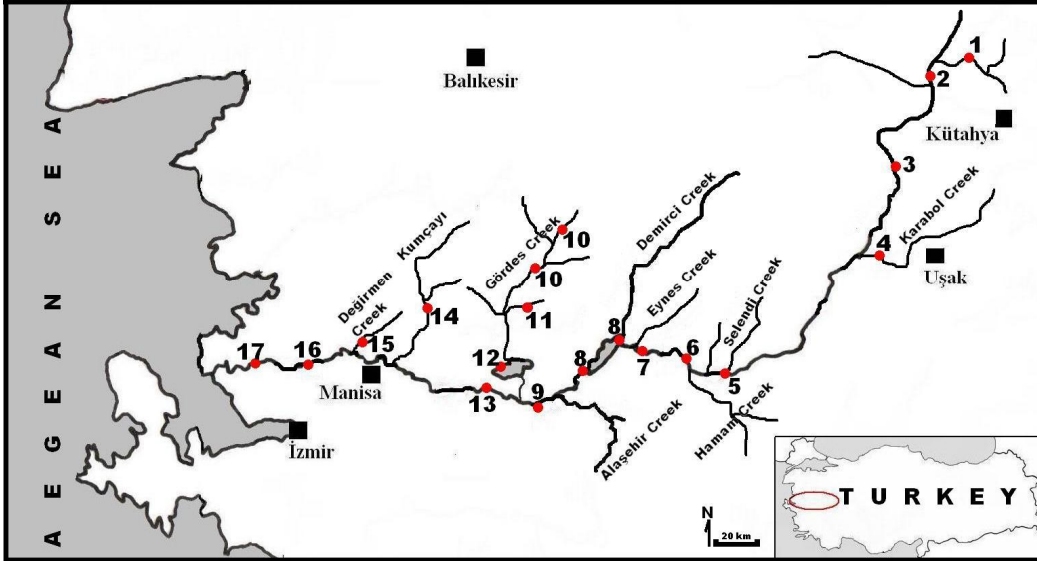


Fig. 1. The map of Gediz River and sampling stations

1. Gümüşlü DSI pomp-Gediz-Kütahya, 2. Abide Bridge-Gediz-Kütahya, 3. Derbent Bridge-Uşak, 4. Karabol Creek-Güre-Uşak, 5. Yenişehir Bridge-Uşak, 6. Yurtbaşı Village-Kula-Manisa, 7. Hamidiye Village-Kula-Manisa, 8. Demirköprü Dam Lake-Salihli-Manisa, 9. Salihli Bridge-Salihli-Manisa, 10. Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa, 11. Akpınar Spring-Gölmarmara-Manisa, 12. Haciveiler Village-Gölmarmara-Manisa, 13. Dibekdere Village-Ahmetli-Manisa, 14. Halitpaşa Bridge-Saruhanlı-Manisa, 15. Göksu Springs-Gülbağçe Village-Manisa, 16. Emiralem DSI pomp-Menemen-İzmir, 17. Bürüncük Village-Menemen-İzmir



Fig. 2. *Onchorynchus mykiss* (SL: 18.90 cm, Gümüşlü DSI pomp-Gediz-Kütahya)

Table 1. Fish taxons, percent distributions (%) and sampling stations in Gediz River (n: native, e: endemic, nn: non-native)

Family	Species	Status	Specimen numbers	Distribution	Sampling station
Anguillidae	<i>Anguilla anguilla</i>	n	2	0.42	16
Cyprinidae	<i>Cyprinus carpio</i>	n	6	1.25	8, 10, 12, 17
	<i>Squalius fellowesii</i>	e	91	18.95	1, 2,3, 4, 5, 6, 9,10,11,16,17, 23,
	<i>Alburnus battalgilae</i>	e	86	17.92	2, 3, 6, 7, 9, 10, 11, 12
	<i>Chondrostoma holmwoodii</i>	e	18	3.75	3, 6, 7, 11
	<i>Capoeta bergamae</i>	e	18	3.75	2, 4, 6, 13
	<i>Ladigesocypris mermere</i>	e	31	6.46	3, 10, 11, 13, 14, 15, 16
	<i>Vimba vimba</i>	n	2	0.42	16
	<i>Barbus pergamonensis</i>	e	70	14.57	1, 2, 3, 4, 6, 10, 11
	<i>Luciobarbus lydianus</i>	e	37	7.71	3, 6, 7, 9, 13
	<i>Rhodeus amarus</i>	n	11	2.29	6, 11, 12, 14
Siluridae	<i>Silurus glanis</i>	n	2	0.42	8
Nemacheilidae	<i>Oxynoemacheilus simavicus</i>	e	69	14.37	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 14, 15
Cobitidae	<i>Cobitis kurui</i>	e	2	0.42	16
	<i>Cobitis fahireae</i>	e	12	2.50	9, 10, 11
Poeciliidae	<i>Gambusia holbrooki</i>	nn	9	1.88	11, 15, 16
Gobiidae	<i>Knipowitschia mermere</i>	e	8	1.67	8, 10, 12
Percidae	<i>Sander lucioperca</i>	n	5	1.04	8, 12
Salmonidae	<i>Onchorynchus mykiss</i>	nn	1	0.21	1

3.3 Family: Cyprinidae

3.3.1 *Cyprinus carpio* Linnaeus, 1758 (Common carp)

Material examined: Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 2 specimens, SL: 5.27-5.71 cm), Hacıveliler Village-Gölmarmara-Manisa (12.07.2010, 2 specimens, SL: 14.0-17.3 cm), Demirköprü Dam Lake-Salihli-Manisa (12.07.2010, 1 specimen, SL: 10.24 cm), Bürüncük Village-Menemen-İzmir (11.07.2010, 1 specimen, SL: 8.69 cm).

Diagnostic characters: DIII 18-20_{1/2}, A II-III 5-6_{1/2}, lateral line scales 36-39, transverse scales 6-7/5-7, pharyngeal teeth 1.1.3-3.1.1, gill rakers 26-30, vertebrae 36-37.

3.3.2 *Squalius fellowesii* (Günther, 1868) (Chub) endemic (Fig. 3)

Material examined: Derbent Bridge-Uşak (22.06.2012, 31 specimens, SL: 6.34-12.14 cm), Abide Bridge-Gediz-Kütahya (12.07.2010, 4

specimens, SL: 8.69-12.58 cm), Gümüşlü DSI pomp-Gediz-Kütahya (22.06.2012, 4 specimens, SL: 11.33-12.83 cm), Gümüşlü DSI pomp-Gediz-Kütahya (12.07.2010, 4 specimens, SL: 10.14-12.58 cm), Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 1 specimen, SL: 8.65 cm), Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 9 specimens, SL: 7.18-10.84 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 1 specimen, SL: 11.77 cm), Yurtbaşı Village-Kula-Manisa (21.06.2012, 4 specimens, SL: 5.26-6.07 cm), Hamidiye Village-Kula-Manisa (12.07.2010, 5 specimens, SL: 7.94-10.36 cm), Karabol Creek-Güre-Uşak (12.07.2010, 4 specimens, SL: 7.36-9.54 cm), Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 4 specimens, SL: 2.66-2.98 cm), Salihli Bridge-Salihli-Manisa (11.07.2010, 4 specimens, SL: 6.84-9.66 cm), Yenişehir Bridge-Uşak (11.07.2010, 4 specimens, SL: 8.25-17.20 cm), Dibekdere Village-Ahmetli-Manisa (11.07.2010, 5 specimens, SL: 6.78-12.56 cm), Bürüncük Village-Menemen-İzmir (11.07.2010, 6 specimens, SL: 7.58-10.56 cm).

Diagnostic characters: D III $7\frac{1}{2}$ - $9\frac{1}{2}$, A III $6\frac{1}{2}$ - $9\frac{1}{2}$, lateral line scales 40-43, transverse scales 7-8/3, pharyngeal teeth 2.5-5.2, gill rakers 6-10.

Dorsal-fin origin above posterior half of pelvic-fin base; upper lip projecting beyond lower lip.

3.3.3 *Alburnus battalgilae* Özuluğ & Freyhof, 2008 endemic (Fig. 4)

Material examined: Derbent Bridge-Uşak (22.06.2012, 28 specimens, SL: 2.28-10.56 cm), Abide Bridge-Gediz-Kütahya (12.07.2010, 3 specimens, SL: 5.87-8.57 cm) Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 10 specimens, SL: 4.57-8.70 cm), Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 27 specimens, SL: 2.82-8.66 cm), Hamidiye Village-Kula-Manisa (12.07.2010, 9 specimens, SL: 6.60-14.74 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 2 specimens, SL: 7.52-9.02 cm), Salihli Bridge-Salihli-Manisa (11.07.2010, 3 specimens, SL: 4.78-11.14 cm), Haciveliler Village-Gölmarmara-Manisa (12.07.2010, 4 specimens, SL: 6.78-10.58 cm).

Diagnostic characters: D III $8\frac{1}{2}$, A III 12-14 $\frac{1}{2}$, P I 16-17, V I 9-10, lateral line scales 53-61,

transverse scales $9\frac{1}{2}$ /3, pharyngeal teeth 2.5-5.2., gill rakers 27-31.

Small size, compressed and very elongate body. Mouth oblique, lower jaw slightly projecting beyond upper jaw. Dark lateral stripe in life. Dorsal fin margin straight, anal fin margin slightly concave.

3.3.4 *Chondrostoma holmwoodii* (Boulenger, 1896) endemic (Fig. 5)

Material examined: Derbent Bridge-Uşak (22.06.2012, 11 specimens, SL: 8.16-16.12 cm), Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 3 specimens, SL: 8.65-14.96 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 1 specimen, SL: 10.09 cm), Hamidiye Village-Kula-Manisa (12.07.2010, 1 specimen, SL: 9.04 cm), Yurtbaşı Village-Kula-Manisa (21.06.2012, 2 specimens, SL: 8.80-9.50 cm).

Diagnostic characters: D III $8\frac{1}{2}$, A III 9-10 $\frac{1}{2}$, lateral line scales 60-66, transverse scales 9-11/5-7, pharyngeal teeth 6-6., gill rakers 21-24.

Mouth straight. Horny layer well developed. Dorsal and anal fins concave in outline.



Fig. 3. *Squalius fellowesii* (SL: 12.58 cm, Abide Bridge-Gediz-Kütahya)



Fig. 4. *Alburnus battalgilae* (SL: 14.74 cm, Hamidiye Village-Kula-Manisa)



Fig. 5. *Chondrostoma holmwoodii* (SL: 16.12 cm, Derbent Bridge-Uşak)

3.3.5 *Capoeta bergamae* Karaman, 1969 endemic (Fig. 6)

Material examined: Yurtbaşı Village-Kula-Manisa (21.06.2012, 3 specimens, SL: 7.48-12.43 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 9 specimens, SL: 8.11-11.84 cm), Dibekdere Village-Ahmetli-Manisa (11.07.2010, 2 specimens, SL: 9.18-10.98 cm), Abide Bridge-Gediz-Kütahya (12.07.2010, 2 specimens, SL: 8.87-11.12 cm), Karabol Creek-Güre-Uşak (12.07.2010, 2 specimens, SL: 7.69-10.12 cm)

Diagnostic characters: D III 7-8 $\frac{1}{2}$, A III 5 $\frac{1}{2}$, P I 15-18, V I 9-10, lateral line scales 60-69, transverse scales 11-13/7-9, pharyngeal teeth 2.3.5-5.3.2, gill rakers 19-24.

Mouth slightly inferior, with single pair very short barbels.

3.3.6 *Ladigesocypris mermere* (Ladiges, 1960) endemic (Fig. 7)

Material examined: Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 3 specimens, SL: 4.80-8.30 cm), Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 6 specimens, SL: 3.27-5.31 cm), Derbent Bridge-Uşak (22.06.2012, 3 specimens, SL: 4.11-5.01 cm), Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 11 specimens, SL: 4.55-7.92 cm), Dibekdere Village-Ahmetli-Manisa (11.07.2010, 2 specimens, SL: 3.58-4.69 cm), Göksu Springs-Gülbahçe Village-Manisa (12.07.2010, 3 specimens, SL: 4.20-5.27 cm), Halitpaşa Bridge-Saruhanlı-Manisa (11.07.2010, 2 specimens, SL: 5.24-5.48 cm)

Diagnostic characters: D III 7-8 $\frac{1}{2}$, A III 7-9 $\frac{1}{2}$, lateral line scales 22-25, scales lateral series 30-32, pharyngeal teeth 2.5-5.2.

General body shape and fin counts are similar to those in *L. ghigii*. Scales are smaller than those in *L. ghigii*. The lateral line is considerably longer than that in the Anatolian *L. ghigii*.

3.3.7 *Vimba vimba* (Linnaeus, 1758)

Material examined: Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 2 specimens, SL: 6.89-10.12 cm).

Diagnostic characters: D III 8 $\frac{1}{2}$, A III 18-20 $\frac{1}{2}$, lateral line scales 58-62, transverse scales 9-10/5-6 $\frac{1}{2}$, pharyngeal teeth 5.-5., gill rakers 16-20.

3.3.8 *Barbus pergamonensis* Karaman, 1971 endemic (Fig. 8)

Material examined: Derbent Bridge-Uşak (22.06.2012, 36 specimens, SL: 4.69-12.57 cm), Gümüslü DSI pomp-Gediz-Kütahya (22.06.2012, 2 specimens, SL: 9.41-8.96 cm), DSI pomp-Gümüslü-Gediz (12.07.2010, 3 specimens, SL: 7.57-8.59 cm), Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 2 specimens, SL: 7.07-11.43 cm), Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 2 specimens, SL: 7.45-8.72 cm), Yurtbaşı Village-Kula-Manisa (21.06.2012, 4 specimens, SL: 5.45-12.77 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 6 specimens, SL: 8.97-12.69 cm), Gümüslü DSI pomp-Gediz-Kütahya (12.07.2010, 7 specimens, SL: 3.21-11.96 cm), Abide Bridge-Gediz-Kütahya (12.07.2010, 4 specimens, SL: 6.58-9.56 cm), Karabol Creek-Güre-Uşak (12.07.2010, 4 specimens, SL: 7.09-9.12 cm)

Diagnostic characters: D III 7-9 $\frac{1}{2}$, A III 5 $\frac{1}{2}$, P I 15-17, V: I 8-9, lateral line scales 52-60, transverse scales 11-12/7-9, pharyngeal teeth 2.3.5-5.3.2, gill rakers 8-11.



Fig. 6. *Capoeta bergamae* (SL: 10.12 cm, Dibekdere Village-Ahmetli-Manisa)



Fig. 7. *Ladigesocypris mermere* (SL: 5.20 cm, Emiralem DSI pomp-Menemen-İzmir)



Fig. 8. *Barbus pergamonensis* (SL: 11.50 cm, Yurtbaşı Village-Kula-Manisa)

3.3.9 Luciobarbus lydianus (Boulenger, 1896) endemic (Fig. 9)

Material examined: Derbent Bridge-Uşak (22.06.2012, 5 specimens, SL: 10.87-12.82 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 2 specimens, SL: 8.02-9.37 cm), Dibekdere Village-Ahmetli-Manisa (11.07.2010, 4 specimens, SL: 8.00-11.25 cm), Hamidiye Village-Kula-Manisa (12.07.2010, 16 specimens, SL: 5.77-13.86 cm), Yurtbaşı Village-Kula-Manisa (21.06.2012, 7 specimens, SL: 16.70-16.78 cm), Salihli Bridge-Salihli-Manisa (11.07.2010, 3 specimens, SL: 9.51-11.50 cm).

Diagnostic characters: D III 7-9 $\frac{1}{2}$, A III 5 $\frac{1}{2}$, P I 17-19, V: I 8-9, lateral line scales 45-48, transverse scales 8/6, pharyngeal teeth 2.3.5-5.3.2, gill rakers 15-17.

Dorsal fin origin directly above pelvic fin origin or very slightly behind it, the caudal fin lobes of equal length, lips fleshy, with the lower lip conspicuously thicker than the upper lip, the middle of the lower lip with a median fleshy pad with shallow groove posteriorly and a well developed black spot on each scale pocket back and the level below of the pectorals and pelvics, but not present on the scales on belly.



Fig. 9. *Luciobarbus lydianus* (SL:10.12 cm, Salihli Bridge-Salihli-Manisa)

3.3.10 Rhodeus amarus (Pallas, 1776)
(Bitterling)

Material examined: Yurtbaşı Village-Kula-Manisa (21.06.2012, 2 specimens, SL: 4.16-4.32 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 3 specimens, SL: 3.71-4.81 cm), Halitpaşa Bridge-Saruhanlı-Manisa (11.07.2010, 3 specimens, SL: 3.24-4.17 cm), Haciveliler Village-Gölmarmara-Manisa (12.07.2010, 2 specimens, SL: 2.45-3.89 cm), Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 1 specimen, SL: 4.56 cm)

Diagnostic characters: D III 9-10_{1/2}, A III 8-10_{1/2}, P I 12-13, V II 5-7, lateral line scales 4-7.

3.4 Family: Percidae

3.4.1 Sander lucioperca (Linnaeus, 1758)

Material examined: Demirköprü Dam Lake-Salihli-Manisa (12.07.2010, 2 specimens, SL: 11.25-14.58 cm), Haciveliler Village-Gölmarmara-Manisa (12.07.2010, 3 specimens, SL: 8.97-12.58 cm)

Diagnostic characters: D₁ XIII-XV D₂ II-III 19-23, A III 11-13, P 15-17, V I 5-6, lateral line scales 80-92, transverse scales 13-16/16-22, gill rakers 13-14.

3.5 Family: Nemacheilidae

3.5.1 Oxynoemacheilus simavicus (Balık & Banarescu, 1978) endemic (Fig. 10)

Material examined: Derbent Bridge-Uşak (22.06.2012, 15 specimens, SL: 3.64-7.02 cm), DSI pomp-Gümüşlü-Gediz (22.06.2012, 10 specimens, SL: 3.32-6.28 cm), Gümüşlü DSI pomp-Gediz-Kütahya (12.07.2010, 5 specimens, SL: 4.57-5.98 cm), Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 2 specimens, SL: 3.01-5.23

cm), Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (21.06.2012, 5 specimens, SL: 3.19-4.52 cm), Hamidiye Village-Kula-Manisa (12.07.2010, 1 specimen, SL: 4.79 cm), Yurtbaşı Village-Kula-Manisa (12.07.2010, 4 specimens, SL: 3.58-4.056 cm), Yurtbaşı Village-Kula-Manisa (21.06.2012, 9 specimens, SL: 3.06-5.17 cm), Abide Bridge-Gediz-Kütahya (12.07.2010, 2 specimens, SL: 2.58-4.76 cm), Salihli Bridge-Salihli-Manisa (11.07.2010, 1 specimen, SL: 5.18 cm), Göksu Springs-Gülbahçe Village-Manisa (12.07.2010, 4 specimens, SL: 4.69-4.89 cm), Halitpaşa Bridge-Saruhanlı-Manisa (11.07.2010, 5 specimens, SL: 4.47-6.57 cm), Yenişehir Bridge-Uşak (11.07.2010, 3 specimens, SL: 3.22-5.12 cm), Karabol Creek-Güre-Uşak (12.07.2010, 3 specimens, SL: 2.12-4.69 cm)

Diagnostic characters: D III 8-9_{1/2}, A III 5-6_{1/2}, P I 11-12_{1/2}, V II 8

3.6 Family: Cobitidae

3.6.1 Cobitis kurui Erk'akan, Atalay-Ekmekçi & Nalbant, 1998 endemic (Fig. 11)

Material examined: Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 2 specimens, SL: 4.43-6.46 cm)

Diagnostic characters: D III 7, A III 5-6, P I 8-9, V I 5 (6)

C.kurui is similar to *C.vardarensis* but differs essentially from it in the lesser size of the black spot at caudal base, which is brownish and a reduced in size of lateral spots.

3.6.2 Cobitis fahireae Atalay-Ekmekçi & Nalbant, 1998 endemic (Fig. 12)

Material examined: Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 4 specimens, SL: 4.49-6.08), Gördes Creek-Gölmarmara DSI

pomp-Gölmarmara-Manisa (21.06.2012, 7 specimens, SL: 4.23-6.14 cm), Salihli Bridge-Salihli-Manisa (11.07.2010, 1 specimen, SL: 4.66 cm),

Diagnostic characters: D III 7 (6), A II-III 5, P I 9 V I 6

C. fahirae with a relatively high and compressed body and with all four of Gambetta's pigmentary zones, but with third one slightly reduced. The jet black caudal spot rounded and rather small.

3.7 Family: Poeciliidae

3.7.1 *Gambusia holbrooki* (Baird and Girard, 1853) (Mosquitofish) non-native (Fig. 13)

Material examined: Akpınar Spring-Gölmarmara-Manisa (21.06.2012, 1 specimen, SL: 3.74 cm), Emiralem DSI pomp-Menemen-İzmir (12.07.2010, 2 specimens, SL: 3.84-4.57 cm), Göksu Springs-Gülbahçe Village-Manisa (12.07.2010, 6 specimens, SL: 4.12-4.25 cm).

Diagnostic characters: D I-II 6-7, A I-II 7-8, scales lateral series 28-32.

3.8 Family: Gobiidae

3.8.1 *Knipowitschia mermere* Ahnelt, 1995 endemic (Fig. 14)

Material examined: Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa (12.07.2010, 3 specimens, SL: 2.93-3.26 cm), Haciveliler Village-Gölmarmara-Manisa (12.07.2010, 2 specimens, SL: 2.76-2.98 cm), Demirköprü Dam Lake-Salihli-Manisa (12.07.2010, 3 specimens, SL: 2.75-3.18 cm)

Diagnostic characters: D₁ VI, D₂ I 7-8, A I 7, P 16-17, scales lateral series 30-32

3.9 Family: Siluriidae

3.9.1 *Silurus glanis* (Linnaeus, 1758) (Wels catfish)

Material examined: Demirköprü Dam Lake-Salihli-Manisa (12.07.2010, 2 specimens, SL: 24.58-38.45 cm)

Diagnostic characters: D X-XI 11-12, A III 10-11, P I 10-11, V I-II 5-6, lateral line scales 36-44, transverse scales 7-9/11-15.



Fig. 10. *Oxynoemacheilus simavicus* (SL: 5.58 cm, Gümüşlü DSI pomp-Gediz-Kütahya)



Fig. 11. *Cobitis kurui* (SL: 4.43 cm, Emiralem DSI pomp-Menemen-İzmir)



Fig. 12. *Cobitis fahireae* (SL: 5.87 cm, Akpınar Spring-Gölmarmara-Manisa)



Fig. 13. *Gambusia holbrooki* (SL: 3.90 cm, Emiralem DSI pomp-Menemen-İzmir)



Fig. 14. *Knipowitschia mermere* (SL: 2.93 cm, Gördes Creek-Gölmarmara DSI pomp-Gölmarmara-Manisa)

4. DISCUSSION AND CONCLUSION

The Gediz River is the most important river in the northern Aegean region. A natural habitat in the lower basin streams of the Gediz River are at large risk. Sub-region, especially in summer, the rivers and polluting the water losses due to factors batches of fish kills are observed. This is particularly the generation of local and endemic Anatolia will lead to endanger. Due to a lot of exotic species and pollution in the Büyük Menderes River, one of the neighbors basins, is reported to be endangered endemic species (14). In previous studies, it is noteworthy that the

scarcity of the species in Bakırçay River (adjacent basins) [2,16].

Earlier studies conducted in the Gediz River; 19 taxa belonging to 8 families (Samples were taken from a single station) [16], 13 taxa belonging to 7 families [2], 9 taxa belonging to 4 families (Samples were taken from the upper part of the river) [15] were identified. Neighbors or relatives in the studies in the basin; 34 taxa belonging to 13 families (Büyük Menderes River) [14], 7 taxa belonging to 4 families (Bakırçay) [16] and 5 taxa belonging to 3 families (Bakırçay) [2] were determined (Table 2).

Table 2. Fish fauna studies in the Gediz River and adjacent basins

Studies		This study	Gediz River (2)	*Gediz River (16)	**Gediz River (15)	Büyük Menderes River (14)	Bakırçay (2)	*Bakırçay (16)
Family	Species							
Anguillidae	<i>Anguilla anguilla</i>	+	+	+	-	+	+	+
Cyprinidae	<i>Cyprinus carpio</i>	+	+	+	-	+	-	-
	<i>Carassius gibelio</i>	-	-	-	-	+	-	-
	<i>Squalius fellowesii</i>	+	+	+	+	+	+	+
	<i>Squalius carinus</i>	-	-	-	-	+	-	-
	<i>Alburnus battalgilae</i>	+	-	+	-	-	-	-
	<i>Alburnus cf. demiri</i>	-	-	-	-	+	-	-
	<i>Alburnoides cf. smyrnae</i>	-	-	-	-	+	-	-
	<i>Chondrostoma holmwoodii</i>	+	+	+	+	-	+	+
	<i>Chondrostoma meandrense</i>	-	-	-	-	+	-	-
	<i>Capoeta bergamae</i>	+	-	+	+	+	-	+
	<i>Ladigesocypris mermere</i>	+	-	-	-	+	-	-
	<i>Vimba vimba</i>	+	+	+	-	-	-	-
	<i>Vimba mirabilis</i>	-	-	-	-	+	-	-
	<i>Tinca tinca</i>	-	-	-	-	+	-	-
	<i>Barbus pergamonensis</i>	+	-	-	-	+	-	-
	<i>Barbus oligolepis</i>	-	+	+	+	-	-	-
	<i>Luciobarbus lydianus</i>	+	+	+	+	-	-	-
	<i>Luciobarbus kottelati</i>	-	-	-	-	+	-	-
	<i>Petroleuciscus smyrnaeus</i>	-	-	-	-	+	-	-
	<i>Pseudophoxinus maeandri</i>	-	-	-	-	+	-	-
	<i>Pseudophoxinus maeandricus</i>	-	-	-	-	+	-	-
	<i>Gobio maeandricus</i>	-	-	-	-	+	-	-
	<i>Hemigrammocapoeta kemali</i>	-	-	-	-	+	-	-
	<i>Pseudorasbora parva</i>	-	-	-	-	+	-	-
	<i>Rhodeus amarus</i>	+	+	+	-	+	-	-
	<i>Chalcalburnus chalcoides derjugini</i>	-	+	+	+	-	+	-
Esocidae	<i>Esox lucius</i>	-	-	-	-	+	-	-
Siluridae	<i>Silurus glanis</i>	+	-	+	-	+	-	-
Cyprinodontidae	<i>Aphanius anatoliae</i>	-	-	-	-	+	-	-
	<i>Aphanius fasciatus</i>	-	-	-	-	+	-	-
Nemacheilidae	<i>Oxynoemacheilus simavicus</i>	+	+	+	+	-	-	-
	<i>Oxynoemacheilus cf. cinicus</i>	-	-	-	-	+	-	-
	<i>Oxynoemacheilus germencicus</i>	-	-	-	-	+	-	-
Cobitidae	<i>Cobitis kurui</i>	+	+	+	-	-	-	-
	<i>Cobitis fahireae</i>	+	+	-	+	-	-	-
	<i>Cobitis cf. simplicispina</i>	-	-	-	-	+	-	-
Poeciliidae	<i>Gambusia holbrooki</i>	+	+	+	-	+	-	-
Gobiidae	<i>Knipowitschia mermere</i>	+	-	-	-	-	-	-
	<i>Knipowitschia caucasica</i>	-	-	-	-	+	-	-
Atherinidae	<i>Atherina boyeri</i>	-	-	-	-	+	-	-
Centrarchidae	<i>Lepomis gibbosus</i>	-	-	-	-	+	-	-

Studies		This study	Gediz River (2)	*Gediz River (16)	**Gediz River (15)	Büyük Menderes River (14)	Bakırçay (2)	*Bakırçay (16)
Percidae	<i>Sander lucioperca</i>	+	+	+	-	-	-	-
Salmonidae	<i>Onchorynchus mykiss</i>	+	-	-	+	-	-	-
Blenniidae	<i>Salaria pavo</i>	-	-	-	-	-	+	-
Syngnathidae	<i>Syngnathus abaster</i>	-	-	-	-	+	-	-
Mugilidae	<i>Mugil cephalus</i>	-	+	+	-	-	-	+
	<i>Liza aurata</i>	-	+	+	-	-	-	+
	<i>Liza ramada</i>	-	-	+	-	+	-	+

*Samples were taken from a single station, **Samples were taken from the upper part of the river

In previous studies in the Gediz River, were seen *O. mykiss* species [2,16]. With the establishment of trout farms in the upper part of the river in the 2000s, began to be seen *O. mykiss* species in the river today.

Compared to previous studies, were recorded for the first time *L. mermere* and *K. mermere*.

Individuals *B. pergamonensis* streams in the upper basin with plenty of oxygen, and secluded rocky bottom habitat areas as they choose. There are 8-10 cm individuals as quite intense. The large number of individuals show less dispersion. *S. fellowesii* species, distributed in all regions of streams and rivers have shown the most dominant taxa formed. *A. battalgilae* have formed school still in the upper regions of the river. *C. holmwoodii* has created is quite sparse populations. *O. simavicus* with high ecological tolerance is mainly distributed in all regions (especially the upper basin of the river).

Sub-basin of the river, is under the influence of pollutants. This particular species and is endemic to create a negative pressure. Sub-basin showing the density and *C. bergamae* *L. lydianus* species flocks formed by creating a living space together. Caught in the river sub-basins *C. fahireae* and *C. kurui* species are distributed in small and confined areas.

The upper part of the stream is partially clean. In these regions, *B. pergamonensis*, *C. holmwoodii* and *O. simavicus* is dominant. While in the lower regions of the river *L. lydianus*, *C. bergamae* and *S. fellowesii* were found to be dominant.

As a result; in the Gediz River, where there are 19 fish taxa, 44% of taxa is understood that

endemic. And especially the endemic species on the basis of the IUCN criteria must be protected.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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