

A Taxonomical Study on the Inland Water Fishes of Muğla

*Fevzi Yılmaz¹, Murat Barlas¹, Bülent Yorulmaz², Nedim Özdemir³

¹Department of Biology, Faculty of Arts and Sciences, Muğla University, 48000, Muğla, Turkey

²Department of Biology, Faculty of Sciences, Ege University, 35100, Bornova, Izmir, Turkey

³Fisheries Faculty, Muğla University, 48000, Muğla, Turkey

*E mail: yfevzi@mu.edu.tr

Özet: Muğla iç su balıkları üzerine taksonomik bir çalışma. Bu çalışma, 1999-2003 yılları arasında Muğla il sınırları içinde yer alan akarsulardan, Eşençay, Tersakan, Dalaman, Yuvarlakçay, Namnam, Dipsiz-Çine ve Sarıçay akarsuları, Kocagöl, Köyceğiz gölleri ve Mumcular, Geyik, Bereket baraj göllerinde balık faunasının ortaya çıkarılması amacıyla yürütülmüştür. Çalışma sonucunda, 15 familyaya ait 26 tür ve 6 alttürün yaşadığı anlaşılmıştır. Bunlar; Cyprinidae; *Leuciscus cephalus*, *Leuciscus smyrnaeus*, *Barbus plebejus escherichi*, *Barbus capito pectoralis*, *Capoeta capoeta bergamae*, *Ladigesocypris ghigii ghigii*, *Cyprinus carpio*, *Carassius carassius*, *Pseudorasbora parva*, *Alburnus orontis*, *Alburnoides bipunctatus*, *Vimba vimba tenella* Siluridae; *Siluris glanis*, Anguillidae; *Anguilla anguilla*, Cyprinodontidae; *Aphanius fasciatus*, Cobitidae; *Cobitis taenia*, *Cobitis simplicispina*, Balitoridae; *Orthrias angorae*, Mugilidae; *Mugil cephalus*, *Liza ramada*, *Liza labeo*, *Liza aurata*, *Liza saliens*, *Chelon labrosus*, Salmonidae; *Salmo trutta macrostigma*, Cichlidae; *Tilapia zillii*, Blenniidae; *Blennius fluviatilis*, Gobiidae; *Gobius ophicephalus*, Poecilidae; *Gambusia affinis*, Centrarchidae; *Lepomis gibbosus*, Moronidae; *Morone labrax*, Atherinidae; *Atherina boyeri*.

Anahtar Kelimeler: İç Sular, Balık Faunası, Taksonomi, Muğla.

Abstract: This study was carried out between 1999-2003 on Eşençay, Tersakan, Dalaman, Yuvarlakçay, Namnam, Dipsiz-Çine and Sarıçay rivers, Kocagöl, Köyceğiz lakes and Mumcular, Geyik, Bereket dam lakes to determine the inland fish fauna of Muğla. As a result, 26 species and 6 subspecies belonging to 15 families were found to be living in the region. These are; Cyprinidae; *Leuciscus cephalus*, *Leuciscus smyrnaeus*, *Barbus plebejus escherichi*, *Barbus capito pectoralis*, *Capoeta capoeta bergamae*, *Ladigesocypris ghigii ghigii*, *Cyprinus carpio*, *Carassius carassius*, *Pseudorasbora parva*, *Alburnus orontis*, *Alburnoides bipunctatus*, *Vimba vimba tenella* Siluridae; *Siluris glanis*, Anguillidae; *Anguilla anguilla*, Cyprinodontidae; *Aphanius fasciatus*, Cobitidae; *Cobitis taenia*, *Cobitis simplicispina*, Balitoridae; *Orthrias angorae*, Mugilidae; *Mugil cephalus*, *Liza ramada*, *Liza labeo*, *Liza aurata*, *Liza saliens*, *Chelon labrosus*, Salmonidae; *Salmo trutta macrostigma*, Cichlidae; *Tilapia zillii*, Blenniidae; *Blennius fluviatilis*, Gobiidae; *Gobius ophicephalus*, Poecilidae; *Gambusia affinis*, Centrarchidae; *Lepomis gibbosus*, Moronidae; *Morone labrax*, Atherinidae; *Atherina boyeri*.

Key Words: Inland Water, Fish Fauna, Taxonomy, Muğla.

Introduction

There are many researches, carried out by Turkish and foreign researchers, on the fresh water fish fauna of Turkey. However, these studies were usually based on basins and carried out with limited field study. Because of this reason, detailed studies focusing on these areas must be done.

Muğla, located between 36° 17' and 37° 33' Northern latitude and 27° 13' and 29° 46' Eastern longitude, has 13 328 km² surface area and a very rough terrain. The province is located in the basins of Büyük Menderes, Dalaman and Eşen rivers and surrounded by Mediterranean Sea in the South and by Aegean Sea in the West. Major water sources in the province are; Eşençay, Dalaman, Namnam, Yuvarlakçay, Dipsiz-Çine, Sarıçay rivers, Kocagöl, Köyceğiz lakes and Mumcular, Geyik and Bereket dam lakes (Anonim, 1998). There are many researches conducted in Köyceğiz Lake and lagoon system (Buhan, 1998). Balık (1975) carried out a taxonomic and ecological survey in South-Western Turkey including some rivers in the Muğla province. Balık (1988) made a study on systematical and zoogeographical features of

freshwater fishes of Mediterranean region of Turkey. Balık (1995) reported endemic freshwater fish taxa of Mediterranean region of Turkey and their diagnostic characters.

Bogustkaya (1996) contributed to the knowledge of three Leuciscine fishes, *Leuciscus borysthenticus* (Kessler, 1859), *Leuciscus smyrnaeus* Boulenger, 1896 and *Ladigesocypris ghigii* (Gianferrari, 1927). Bogustkaya (1997) reported an annotated check-list of Leuciscine fishes of Turkey.

Barlas et al. (2000) identified the fish fauna in Yuvarlakçay River running into Köyceğiz Lake. Yılmaz et al. (2000) and Yılmaz and Öğretmen (2001) studied the breeding and living aspects of *Ladigesocypris ghigii ghigii*, an endemic species in Muğla area. Barlas et al. (2001) introduced an exotic species, *Lepomis gibbosus*, found in Muğla. Barlas et al. (2001) explored the fish fauna of Tersakan River. Yılmaz (2004) performed a study on the fish fauna and physico-chemical characteristics of Mumcular Dam Lake. Özdemir et al. (2003) investigated freshwater fishes and ecological features of Namnam River, running in to Köyceğiz Lake. Barlas and Dirican (2005) analysed the fish fauna at Dipsiz-Çine River. Onaran et al. (2006) determined freshwater fishes

fauna of Eşen River. This study aims to display the fauna of fresh water fishes living in the water sources within the boundaries of Muğla province and to mention the latest conditions.

Material and Methods

The fish samples were caught mainly by electro-shocker in the area of research. The cast-nets and fishing lines were also used when required. The samples were collected from the stations (Figure.1) at certain intervals in the period between 1999 and 2003. The samples were fixed by the 4 % formaldehyde solution in the field and were carried to the Muğla University Hydrobiology Research Laboratory.

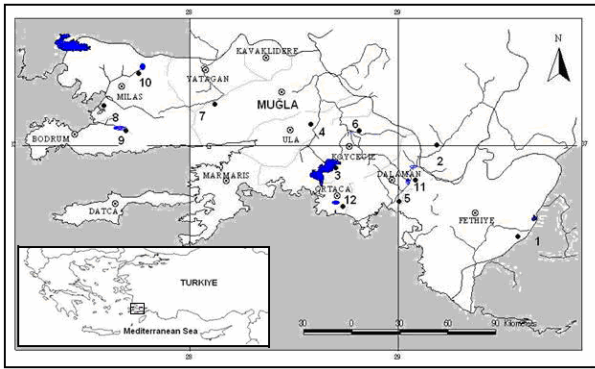


Figure 1. Study Area and Stations (*) 1-Eşençay= Kocaçay River 2-Dalaman River 3-Köyceğiz Lake 4-Namnam River 5-Tersakan River 6-Yuvarlakçay River 7-Dipsiz-Çine River 8-Sarıçay River 9-Mumcular Dam Lake 10-Geyik Dam Lake 11-Bereket Dam Lake 12-Kocagöl Lake.

Results

The results of the field and laboratory studies of this research indicate that 26 species and 6 subspecies belonging to 15 families are present in the research area (Table 1.).

In order to diagnose the fish species Geldiay and Balık (1998), Bogutskaya (1996, 1997) and to identify their systematic categories Müller (1983) were used.

Classis: Osteichthyes

Superordo: Teleostei

Ordo: Clupeiformes

Familia: Salmonidae

Salmo trutta macrostigma Dumeril, 1858

Ordo: Cypriniformes

Familia: Cyprinidae

Leuciscus cephalus (Linnaeus, 1758)

Leuciscus smyrnaeus Boulenger, 1896

Barbus plebejus escherichi Steindachner, 1897

Barbus capito pectoralis Heckel, 1843

Capoeta capoeta bergamae Karaman, 1971

Ladigesocypris ghigii ghigii Gienferrari, 1927

Cyprinus carpio Linnaeus, 1758

Carassius carassius (Linnaeus, 1758)

Pseudorasbora parva (Temminck and Schegel, 1842)

Alburnus orontis Sauvage, 1882

Alburnoides bipunctatus (Bloch, 1782)

Vimba vimba tenella Nordmann, 1840

Ordo: Siluriformes

Familia: Siluridae

Siluris glanis Linnaeus, 1758

Familia: Cobitidae

Cobitis taenia Linnaeus, 1758

Cobitis simplicispina Hanks, 1924

Familia: Balitoridae

Orthrias angorae Steindachner, 1897

Ordo: Anguilliformes

Familia: Anguillidae

Anguilla anguilla (Linnaeus, 1758)

Ordo: Cyprinodontiformes

Familia: Poeciliidae

Gambusia affinis Baird and Girard, 1853

Familia: Cichlidae

Tilapia zilli (Gervais, 1848)

Familia: Cyprinodontidae

Aphanius fasciatus Cuvier and Valenciennes, 1821

Ordo: Perciformes

Familia: Moronidae

Morone labrax (Linnaeus, 1758)

Familia: Centrarchidae

Lepomis gibbosus (Linnaeus, 1758)

Familia: Blenniidae

Blennius fluviatilis Asso, 1801

Familia: Gobiidae

Gobius ophicephalus Palas, 1811

Ordo: Mugiliformes

Familia: Mugilidae

Mugil cephalus Linnaeus, 1758

Liza ramada Risso, 1826

Mugil (Oedalechilus) labeo Cuvier, 1829

Liza aurata Risso, 1810

Liza saliens Risso, 1810

Chelon labrosus Risso, 1826

Familia: Atherinidae

Atherina boyeri Risso, 1810

Discussion

As a result, 26 species and 6 subspecies belonging to 15 families were detected in Muğla area through this study. Moreover, this number would definitely increase when some sea-origin species described in the previous studies carried out in Köyceğiz-Dalyan lagoon system were included. Cyprinidae family with 13 species forms the majority in the research area. Mugilidae members which were found intensively in Köyceğiz-Dalyan area represented with 6 species. The other fish species worth considering are *Salmo trutta macrostigma*, a natural trout, which was observed at the upper zones of Eşen River, an endemic species living in Dalaman and Marmaris area, *Ladigesocypris ghigii ghigii* and exotic species like *Tilapia zilli*, *Carassius carassius* and *Lepomis gibbosus* which were imported to some lakes whose

negative impacts have been observed. According to their distribution, the most common species in the studied 13 water sources were *Anguilla anguilla* which was observed at 10

stations and *Leuciscus cephalus* which was observed at 9 stations. The other common species were *Barbus plebejus escherichi*, *Capoeta capoeta bergamae* and *Mugil cephalus*.

Table 1. Inhabiting fish species according to stations in the study area.

| Stations Fish species | Esen R. | Tersakan R. | Yuvarlakçay R. | Namnam R. | Sarıçay R. | Dipsiz-Çine R. | Dalaman R. | Köyceğiz L. | Kocagöl L. | Geyik D.L. | Mumcular D. L. | Bereket D. L. | Total |
|-------------------------------------|-----------|-------------|----------------|-----------|------------|----------------|------------|-------------|------------|------------|----------------|---------------|-------|
| <i>Anguilla anguilla</i> | + | + | + | + | + | + | + | + | + | | | + | 10 |
| <i>Salmo trutta macrostigma</i> | + | | | | | | | | | | | | 1 |
| <i>Leuciscus cephalus</i> | + | + | + | + | + | + | | | | | + | + | 9 |
| <i>Leuciscus smyrnaeus</i> | | | | + | + | + | | | | | | | 3 |
| <i>Barbus plebejus escherichi</i> | + | + | + | + | + | + | | + | | | | | 8 |
| <i>Barbus capito pectoralis</i> | | | | | | + | | | | | | | 2 |
| <i>Capoeta capoeta bergamae</i> | + | + | + | + | | + | | + | | | | | 7 |
| <i>Ladigesocypris ghigii ghigii</i> | | + | + | + | | | | + | | | | | 4 |
| <i>Cyprinus carpio</i> | | | | | + | | | + | | + | + | | 4 |
| <i>Carassius carassius</i> | + | | | | | | | | | + | + | | 3 |
| <i>Pseudorasbora parva</i> | | | | | + | + | | | | | | | 2 |
| <i>Alburnus orontis</i> | | | | | | + | | | | | | | 1 |
| <i>Alburnoides bipunctatus</i> | | | | | | + | | | | | | | 1 |
| <i>Vimba vimba tenella</i> | | | | | | + | | | | | | | 1 |
| <i>Cobitis taenia</i> | | | + | | + | | | + | | | | | 3 |
| <i>Cobitis simplicispina</i> | | + | | | | + | | + | | | | | 3 |
| <i>Orthrias angorae</i> | | | | | + | + | | + | | | | | 4 |
| <i>Aphanius fasciatus</i> | | | | | | | | + | | | | | 1 |
| <i>Siluris glanis</i> | | | | | | | | + | | | | | 1 |
| <i>Mugil cephalus</i> | + | + | | | | | + | + | + | | | + | 6 |
| <i>Liza ramada</i> | + | + | + | | | | | + | | | | | 4 |
| <i>Liza labeo</i> | + | | | | | | | + | | | | | 2 |
| <i>Liza aurata</i> | | | | | | | | + | + | | | | 2 |
| <i>Liza saliens</i> | + | | | | | | | + | | | | | 2 |
| <i>Chelon labrosus</i> | | | | | | | + | + | | | | + | 3 |
| <i>Tilapia zilli</i> | | | + | | | | | + | | | | | 2 |
| <i>Blennius fluviatilis</i> | + | + | + | | | | | | | | | | 3 |
| <i>Gobius ophicephalus</i> | | + | + | | | | | | | | | | 2 |
| <i>Gambusia affinis</i> | | + | + | | | + | | + | | | | | 5 |
| <i>Lepomis gibbosus</i> | | | | | + | + | | | | + | | | 3 |
| <i>Morone labrax</i> | | | | | | | | + | | | | | 1 |
| <i>Atherina boyeri</i> | + | | | | | | | + | | | | | 2 |
| Total | 12 | 11 | 11 | 6 | 10 | 14 | 3 | 20 | 3 | 3 | 3 | 4 | |

Based on the distributions in the stations, it can be told that 20 species live in Köyceğiz Lake, 14 species live in Dipsiz-Çine River and 12 species in Eşen River, 11 species in Tersakan and Yuvarlakçay rivers, 10 species in Sarıçay River and less than 10 species, usually 6-7, live in the other rivers and 3-4 species in dam lakes. The reason of this unexpected small number in the dam lakes can be explained by the negative impacts of the exotic fishes which were wrongly imported to these habitats. Some species only live at one station and some sea-origin species only live at the mouth of rivers.

The origins of fish species in the area are as follows according to Geldiay and Balık (1998), Kosswig (1951), Tortonese (1955), and Balık (1995); Mediterranean; *Anguilla anguilla*, *Ladigesocypris ghigii ghigii*, *Mugil cephalus*, *Liza ramada*, *Liza labeo*, *Liza aurata*, *Liza saliens*, *Chelon labrosus*, *Morone labrax*, Glacial relict; *Salmo trutta macrostigma*, *Gobius ophicephalus*, Thetis relict; *Aphanius*

fasciatus, Sarmatic relict; *Atherina boyeri*, *Blennius fluviatilis*, Europe-Asian; *Leuciscus cephalus*, *Leuciscus smyrnaeus*, *Alburnus orontis*, *Alburnoides bipunctatus*, *Vimba vimba tenella*, *Cobitis taenia*, *Cobitis simplicispina*, *Orthrias angorae*, *Siluris glanis*, South-East Asia (India-China); *Barbus plebejus escherichi*, *Barbus capito pectoralis*, *Cyprinus carpio*, *Carassius carassius*, *Pseudorasbora parva*, Near-East Asia (Mezopotamia); *Capoeta capoeta bergamae*, Africa; *Tilapia zilli*, America; *Gambusia affinis*, *Lepomis gibbosus*. Differences between the species reported by the former studies and the species studied in the research area have been noted. Balık (1975) informed us about *Capoeta capoeta bergamae*, *Barbus capito pectoralis*, *Anguilla anguilla*, *Leuciscus cephalus*, *Siluris glanis*, *Gambusia affinis*, *Atherina boyeri*, *Mugil cephalus*, *Liza aurata*, *Cyprinus carpio*, *Barbus plebejus escherichi* from the research area. But *Perca fluviatilis*, reported from Köyceğiz Lake by Balık (1975) have not been observed during this study. *Mugil cephalus*, *Liza*

saliens, *Liza aurata*, *Liza ramada*, *Chelon labrosus* reported by Buhan (1998) from Köyceğiz Lake have been observed by this research as well. *Liza labeo* has been reported in addition to Buhan (1998).

We can conclude that Muğla area can be regarded rich in terms of fresh water fish fauna. However, agricultural, tourist and urban activities have negative impacts on the habitat of the species. Another negative condition is the implantation of fish to lakes and rivers. Some species reported by former studies have not been observed as a result of these negative conditions. This study revealed some newly implanted species which went un-observed by former studies.

References

- Anonim, 1998. Report on the environmental position of Muğla city (in Turkish), Muğla Valiliği İl Çevre Müdürlüğü Yayını.
- Balık, S. 1975. Taxonomical and ecological investigations upon freshwater fishes of western Anatolia, (in Turkish). Ege Üniv. Fen Fak. İlmî Rap. Seri No: 236, 69.
- Balık, S. 1988. Systematical and Zoogeographical Investigations on the Inland Fishes of Mediterranean Region. Doğa TU Zooloji D. 12. 2. 157-179.
- Balık, S. 1995. Freshwater fishes in Anatolia. Biological Conservation. 72: 213-223.
- Barlas, M. Yılmaz, F. Dirican, S. and Yorulmaz, B. 2000. Investigation of fish fauna of Yuvarlakçay (Köyceğiz-Muğla) river, (in Turkish). Doğu An.Böl. IV. Su Ür. Semp. Erzurum, 423-436.
- Barlas, M. Dirican, S. and Özdemir, N. 2001. Fish fauna of Tersakan river, (in Turkish). XI. Ulusal Su Ürünleri Sempozyumu. Hatay, 309-318.
- Barlas, M. Yılmaz, F. and Dirican, S. 2001. A new exotic species: *Lepomis gibbosus* (Perciformes: Centrarchidae) inhabiting Sarıçay (Milas) river and Dipsiz-Çine river, (in Turkish). IV. Ulusal Çevre ve Ekoloji Kong.. Bodrum, 307-325.
- Bogutskaya, N. 1996. Contribution to the knowledge of Leuciscine fishes of Asia Minor. Part. 1. Morphology and taxonomic relationships of *Leuciscus borysthenicus* (Kessler, 1859), *Leuciscus smyrnaeus* Boulenger, 1896 and *Ladigesocypris ghigii* (Gianferrari, 1927) (Cyprinidae, Pisces). Publ. Espec. Inst. Esp. Oceanogr. 21: 25-44.
- Bogutskaya, N. 1997. Contribution to the knowledge of Leuciscine Fishes of Asia Minor. Part. 2. An. Check-List of Leuciscine fishes of Turkey with descriptions of a new species and two new subspecies. Mitt. Hamb. Zool. Mus. Inst. Band. 94: 161-186.
- Buhan, E. 1998. Development of lagoon managment by the reserach on the gray mullet in Koyceğiz lagoon system, (in Turkish). Bodrum Su Ür. Araş. Ens. Seri B Yayın No:3.
- Dirican, S. and Barlas, M. 2005. Physico-chemical charesteristics and fish of Çine (Muğla-Aydın) stream, (in Turkish). Ekoloji, 14, 54, 25-30.
- Kosswig, C. 1951. The zoogeography of Near and Middle East. Türk Biyoloji Dergisi. Cilt I. Sayı 5: 217-227.
- Müller, H. 1983. Fische Europas. Neumann Verlag. Leipzig-Radebeul
- Özdemir, N. Yılmaz, F. Barlas, M. and Yorulmaz B. 2003. The Ecological Features and Fish Fauna of Namnam River (Köyceğiz) (in Turkish). XII. Ulusal Su Ürünleri Sempozyumu. Elazığ 166-170.
- Onaran, M A. Özdemir, N. Yılmaz F. The Fish Fauna of Eşen Stream (Fethiye-Muğla). Fırat University International Science and Engineering Journal. Vol. 1 No. 1. 35-41.
- Tortonese, E. 1955. The trouts of Asiatic Turkey. Publ. Hidrobiol. Res. Inst. Univ. İst. Seri B. Cilt II: 1-25.
- Yılmaz, F. 2004. Physico-chemical features of Mumcular Dam Lake (Bodrum-Muğla), (in Turkish). Ekoloji, 13, 50, 10-17.
- Yılmaz, F. Barlas, M. Öğretmen, F. Yorulmaz, B. and Dirican S. 2000. A research on an endemic species, *Ladigesocypris ghigii* (Gienferrari, 1927), (in Turkish) . IV. Su Ürünleri Sempozyumu. Erzurum, 437-446.
- Yılmaz, F. and Öğretmen, F. 2001. Growth and reproduction features of *Ladigesocypris ghigii* (Gienferrari, 1927), (in Turkish). XI. Ulusal Su Ür. Sempozyumu. 288-295.