مجلة السلام العلمية
ISSN:2788-6336

Fish Species Distributed in Germeçtepe Dam Lake (Kastamonu- Turkey)

Mahmut Elp1,*, Souad A. S. Adem2, Khaled M. İ. Muftah2, Abdelsalam M. Fılogh2

1 Kastamonu University, Faculty of Fisheries, 37150 Kuzeykent Campus Kastamonu, Turkey
2 Kastamonu University, Institute of Science, 37150 Kuzeykent Campus Kastamonu, Turkey
***Sorumlu yazar e-posta: mahmutelp@kastamonu.edu.tr**

Abstract:

Aim of this study was to determine the biodiversity of Germeçtepe Dam Lake locater on Kastamonu Province. Germeçtepe Dam Lake constructed for irrigation in 1986 built on Şadibey Stream. Şadibey Stream is a branch of Daday Stream. Daday Stream is located on Kızılırmak River Basin. Germeçtepe Dam Lake is used for aquaculture and sportive fishing beside irrigation now days. Collected fish samples were preserved in 4 % formaldehyde. A few days later samples stored in 70% ethanol. Taxonomic measurements were made with dial caliper and recorded to 0.1 mm. All measurements were made point to point. Depend on the measurement, counting and calculations, Capoeta baliki, Squalius pursakensis, Alburnus chalcoides, Cyrinus carpio, Perca fluviatilis and Oncorhynchus mykiss species have been determined to be distributed in the Germeçtepe Dam Lake. In addition, hybrids of Squalius pursakensis and Alburnus chalcoides has also been identified.

Key words: Kastamonu water sources, Fish taxonomy, Fish systematic.

Introduction:

There are around 60,000 vertebrate species reported to fish habitats. Some of these are synonymous and some are incorrectly identified species. It is estimated that the number of valid species is around 50,000. There are also many reports on fish, and the total number of reported species is over 59,000. When synonyms and incorrect identifications are eliminated, there are approximately 35,000 valid fish species (Anonymous, 2018a). These figures also show that fish alone constitute 60% of all vertebrates. when looked at in all, they spread in a wide variety of environments, from deep ocean trenches to high mountain lakes, from saltwater sources to freshwater, from highly acidic lakes to alkaline lakes, from caves to photic zones where the UV value is high and the bright sun is effective. This species diversity is also clearly seen in inland water sources, which contain only 1% of the water in the world (Demir, 2009).

One of the regions where species diversity is rich is our country, Anatolia.

geography. Anatolia is an important transition point in zoogeographic terms. The Persian Gulf and the Red Sea connected to the Indian Ocean in the east and southeast, the Mediterranean in the south, the Black Sea and the Caucasus in the north, and the Balkans and Europe in the west have contributed to the formation of a rich gene repository on Anatolian species diversity (Demirsoy, 2007; Şekercioğlu et al., 2011). In addition to the influence of neighboring geographies, Anatolia's own habitat and climate structure have also increased our species diversity. Generally, there are over 360 species in widespread inland waters, and more than 100 of them are widespread (Kuru et al., 2014; Çiçek et al., 2015). This endemism sometimes grows so much that only a few km2 of area can be

مجلة السلام العلمية
ISSN:2788-6336

squeezed. This is due to the variability of Anatolia's geography and climate. Turkey has important inland water ecosystems in terms of biodiversity with its rivers and lakes covering an area of approximately 10,000 km2. There are 7 drainage basins in Türkiye, which include 26 river basins. The annual precipitation level is approximately 640 mm, and approximately one-third of this amount reaches water reserves, ensuring the continuity of wetlands (Anonymous, 2008). Kastamonu province is located in the Western Black Sea region. Its surface area is 13,108 km². The majority of the province has a fractured land structure and is covered with forests. The province's trade is parallel to the Black Sea, the İsfendiyar (Küre) Mountains, and the Ilgaz Mountains in the east-west bazaar. The river belts in the province are the Gökırmak, Devrez, Filyos, İnebolu, Aydos and Devrekani Streams and their branches. There are many dam lakes, ponds and protection areas in the province. 0.66% of Kastamonu province is protected under various statuses. (Saylar, 2001; Şen and Erkan Buğday, 2015In Kastamonu, fish species and fishing constitute almost all of the aquatic products. Except for sand mussels, which are allowed to be hunted in some years, no other aquatic products are produced. For this reason, the production of aquatic products with economic value in the region is based on fish (Saylar, 2001). Germeçtepe Dam was established on the Şadibey Stream of the Daday Stream, which feeds the Gökırma. It is located south of Germeç Hill. For this reason, the dam was named Germeçtepe. The purpose of the Rock Fill type dam, which was put into operation in 1986, is irrigation. The precipitation area of the dam is 89.5 km2 and the annual average water amount is 13.8 hm3/year. The total lake volume of the dam is 7.3 hm3. The irrigation capacity of the Germeçtepe Dam is 540 hectares and its deepest point is 41.7 (Anonymous 2012). This dam irrigates the Gölkoy plain and its surroundings (İbret, 1998). No biodiversity study has been conducted in the Germeçtepe Dam Lake, which is used for agricultural activities. The aim of this study is to determine the current status of fish species diversity in the Germeçtepe Dam Lake and to create a perspective for the future.

Material and Method:

This study was conducted in Germeçtepe Dam Lake, located in the central Kastamonu region. The study area has a surface area of approximately 54 hectares. Seasonal depth changes of up to 20 m are experienced.

The aim of the study is to determine fish species, and trammel nets and electroshock devices were used while collecting samples. The samples obtained were brought to the laboratory by taking 10% formalin. The samples were The specimens whose fixation process was completed were examined, their photographs were taken, and metric and meristic measurements and counts were performed. Measurements were made using a point-to-point digital caliper. The obtained data were first processed into a form and then transferred to a digital environment to calculate statistical values. Geldiay and Balık (2002) was used as the main source for determining families and genera. Various genus- specific sources were used for

Various genus-specific sources were used to determine the species. IUCN and FISBASE records were used as a basis when giving synonyms of the species (Anomim, 2018a, b, c).

مجلة السلام العلمية
ISSN:2788-6336

Results:

As a result of the study conducted in Germeçtepe Dam Lake, it was observed that the samples obtained belong to the Cyprinidae, Percidae, Salmonidae families.

The caudal fins of the samples belonging to the Cyprinidae family are homocercal and the eyes are symmetrically located on both sides of the body. There is 1 dorsal fin and there are no independent spiny structures in front. The ventral fins are behind the pectoral fins. There is no adipose fin located between the dorsal fin and the caudal fin. The anal fin has the same structure in males and females and the number of soft rays is always less than 40. There is a lateral line. There are no teeth in the mouth, but there are pharyngeal teeth. There may be 0-2 pairs of barbels on the edge of the mouth. Individuals belonging to the Cyprinidae family have these characters.

It was determined that the members of the Cyprinidae family distributed in Germeçtepe Dam Lake belong to the Alburnus, Capoeta, Cyprinus, Squalius genera.

These genera are represented by one species each. The species belonging to the genera are Alburnus chalcoides, Capoeta baliki, Cyprinus carpio, Squalius cf. pursakensis. In addition, the presence of hybrid individuals of the Alburnus chalcoides X Squalius cf. pursakensis species spreading in the environment has been determined. The morphological structure of the species is as in Figure 1-5.

The caudal fins of the specimens belonging to the Salmonidae family are homocercal and the eyes are symmetrically located on both sides of the body. There are no spiny structures in front of the dorsal fin. The ventral fins are behind the pectoral fins. There is one adipose fin located between the dorsal fin and the caudal fin. There is no whisker on the edge of the mouth. Individuals belonging to the Salmonidae family have these characters. The Salmonidae family is also represented by the species Oncorhynchus mykiss. The morphological structure of the species is as in Figure 6.

The tail fins of the specimens belonging to
the Percidae family are homocercal and the eyes are symmetrically placed on both sides of the body. The ventral fins are behind the pectoral fins and have soft rays. There are no spiny structures in front of the dorsal fin. There are 2 dorsal fins and they are as close as if they were fused. The 1st dorsal fin carrying spiny rays carries more than 7 spiny rays. Individuals belonging to the Percidae family have these characters. It was observed that the Percidae family is represented by only one species (Perca fluviatilis) in the dam lake. The morphological structure of the species is as in Figure 7.

KINGDOM: Animalia
PHYLUM : Chordata
CLASSIS : Actinopterygii
ORDER : Cypriniformes
FAMILYA : Cyprinidae
Alburnus chalcoides
Capoeta baliki
Cyprinus carpio
Squalius cf. pursakensis
Alburnuschalcoides X

مجلة السلام العلمية
ISSN:2788-6336

Squalius cf. pursakensis ORDER : Salmoniformes FAMILYA : Salmonidae

Oncorhynchus mykiss
ORDER : Perciformes
FAMILY : Percidae
Perca fluviatilis ORDER : Cypriniformes
Familya : Cyprinidae
Genus : Alburnus
species : Alburnus chalcoides, (Güldenstädt, 1772). Type Locality: Kura River
Turkish Name: Freshwater mackerel Morphological Characters: The general body shape of Alburnus chalcoides is given in Figure 1. The color is dark-grey on the back, silvery on the sides and belly. No banding is seen on the body. There is a nodule-like development in front of the lower jaw and it protrudes forward. The number of lateral line scales varies between 57-70, the number of gill rakers 22-25, the number of anal fin soft rays varies between 13½-14½

Figure 1. Alburnus chalcoides, Turkey: Germeçtepe Dam Lake

ORDER : Cypriniformes Family : Cyprinidae Genus : Capoeta
Species : Capoeta baliki Turan, Kottelat, Ekmekçi & Imamoglu, 2006
Type Locality: Sakarya River
Turkish Name: Siraz, black fish
Morphological Characters: The general body shape of Capoeta baliki is given in Figure 2. The body is shuttle-shaped. There are no bands or spots on the body. The mouth is ventrally located. There are no teeth in the mouth and there are 2 pairs of barbels. The body is covered with relatively small scales that can be seen with the eye. The color is bright milky brown on the back and dirty yellow on the sides and belly.

Figure 2. Capoeta baliki, Turkey: Germeçtepe Dam Lake

مجلة السلام العلمية
ISSN:2788-6336

ORDER : Cypriniformes Family : Cyprinida
Genus: Cyprinus
Species: Cyprinus carpioLinnaeus, 1758 Type Locality: Europe
Turkish Name: Carp
Morphological Characters: The general body shape of Cyprinus carpio is given in Figure 3. The body is laterally compressed. The color is variable and is usually greenish-yellow. There are no teeth in the mouth and there are 2 pairs of barbels. The dorsal fin is quite long, covering more than half of the back and bearing more than twice as many rays as the anal fin. The last simple rays of the dorsal and anal fins are thickened and the back parts have saw-like teeth.

Figure 3. Cyprinus carpio, Turkey: Germeçtepe Dam Lake

ORDER: Cypriniformes
Family : Cyprinidae Genus : Squalius
Species : Squalius cf. pursakensis (Hankó, 1925)
Type Locality: Sakarya River
Turkish Name: Freshwater mullet Morphological Characters: The general body form of Squalius cf. pursakensis is given in Figure 4. The upper lip covers the lower lip. The number of circumpeduncular scales is 14-15. The dorsal fin is positioned behind the pelvic fin. The head length is 26-28% of the standard length.

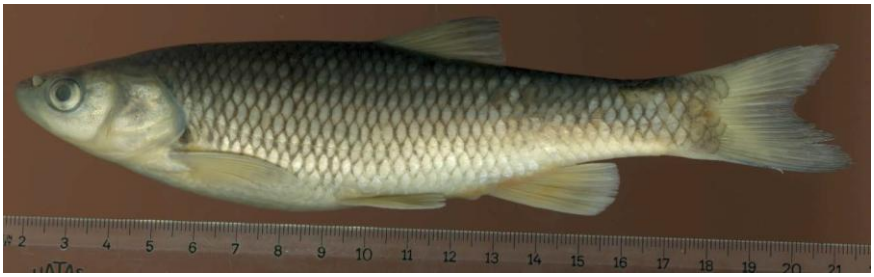

Figure 4. Squalius cf. pursakensis, Turkey: Germeçtepe Dam Lake

ORDER : Cypriniformes Family : Cyprinida
Genus : -----
Species: Hybrid Alburnus chalcoides X Squalius cf. pursakensis
Morphological Characters: The general body shape of Alburnus chalcoides X Squalius cf.

مجلة السلام العلمية
ISSN:2788-6336

pursakensis is given in Figure 5.
At first glance, they appear to be individuals belonging to the Squalius genus. However, as a result of genetic studies, it was understood that they were hybrid individuals.

Figure 5. Alburnus chalcoides pursakensis hybrid, Turkey: Germeçtepe Dam Lake

ORDER: Salmoniformes Family: Salmonidae Genus: Oncorhynchus
Species: Oncorhynchus mykiss (Walbaum 1792)
English Name: Trout, Rainbow Trout
Morphological Characters: The general body shape of Oncorhynchus mykiss is shown in Figure 6.
has been given.The body is shuttle-shaped and has black spots. Vertical banding is seen in young individuals. Spiny rays are not present on the dorsal and anal fins. Adipose fin is present. The mouth is large, barbelless and terminal. The mouth contains lingual, vomer, mandible, maxillary and palatine teeth.

Figure Oncorhynchus mykiss, Turkey: Germeçtepe Dam Lake

ORDER : Perciformes Family : Percida

Genus: Perca
Species: Perca fluviatilis, Linnaeus, 1758 Type Locality: Europe
Turkish Name: Freshwater perch
Morphological Characters: The general body shape of Perca fluviatilis is given in Figure 7. The body is shuttle-shaped and slightly compressed from the sides. There are 8-10

مجلة السلام العلمية
ISSN:2788-6336

vertical bands on the body. Scales are ctenoid in structure. There are canine teeth in the mouth. There are spiny protrusions on the operculum. There are two dorsal fins, the anterior one has a spiny ray. Red coloration is seen in the pectoral, anal and caudal fins.

Figure Perca fluviatilis, Turkey: Germeçtepe Dam Lake

Discussion:

Germeçtepe dam lake is a dam lake built in 1986 for flood prevention and irrigation purposes. Today, cage fishing and sport fishing are carried out in addition to these areas. While organizing this activity, the fact that no biodiversity study was carried out until the decay was revealed as a deficiency. In the study conducted by Saylar (2001) in the region, it was reported that Cyprinus carpio, Squalius cephalus, Capoeta capoeta species were distributed in Germeçtepe Dam Lake. This study is a study that includes many sources. It is not a detailed study for Germeçtepe Dam Lake. In addition, developments in the systematics of inland fishes in the last 15 years have made it necessary to re-evaluate the reported species. The species Squalius cephalus and Capoeta capoeta reported by Saylar (2001) from Germeçtepe Dam Lake do not show distribution in the basin. The said genera are represented by Squalius pursakensis and Capoeta baliki species. In the sampling studies, it was determined that a total of 6 species belonging to 3 families were distributed in the environment. It has been observed that the species that are widespread consist of planktonic-herbivorous, herbivorous and carnivorous feeding species. It is a desired situation in the environments that the species have different feeding habits. However, the lack of economic hunting of the carnivorous Perca fluviatilis species has raised concerns that it may create pressure on other species due to dense population formation. Therefore, there is a need to study the population structure of the species. In addition, A. chalcoides X S. cf.

Hybrid individuals formed by pursakensis individuals were also sampled from the environment. Cyprinidae is the family represented by the highest number of species in our country's inland water resources. The number of species reported to date has reached 200 and new species are recorded every day with the studies conducted (Kuru et al., 2014; Çiçek et al., 2015). The Cyprinidae family is also represented by the highest number of species in Germeçtepe Dam Lake. Alburnus chalcoides, Capoeta baliki, Cyprinus carpio, Squalius cf. pursakensis species belonging to the Cyprinidae family are distributed in the dam lake. While C. baliki, S. cf. pursakensis show natural distribution,A. chalcoides, C.

carpio, species entered the environment later. Again, C. baliki, which is a species distributed in the dam lake, is an endemic species for the region (Turan et al., 2006). Although hesitations have been expressed about the systematic position of C. baliki (Özdemir, 2015), new molecular studies (Bektaş et al., 2017) have eliminated this doubt. The C. carpio species entered the environment later. In interviews with sport hunters and local people in the region, it was noted that the species began to be seen after the construction of the dam. According to the information provided by Saylar (2001), carp grafting was done after the dam was built and this continued in the following years. During our field studies, the presence of mirror carp fry smaller than the grafted size was detected. This shows that carp has established a population in the environment. For this reason, carp should not be introduced to the environment in the following years. Fish and similar alien species released into inland waters, intentionally or unintentionally, for economic purposes, cause irreversible changes in the country's natural inland water biodiversity (Anonymous, 2008). The P. fluviatilis species, which is widespread in the Germeçtepe Dam Lake, has also entered the environment later. It is the species that provides the most prey in the environment. Various from a few cm to 30 cm In addition, individuals of approximately 1 cm in length were observed in trout farming cages. All these show that the species has established a population in the dam lake and has become the dominant species. Discussions were held with the officials of the DSI, the Provincial Directorate of Agriculture, the Provincial Special Administration of the Provincial Directorate of Environment and the Provincial Gendarmerie Command regarding the species. P. fluviatilis türünün ortama nasıl girdiği belirl It has not been determined how P. fluviatilis entered the environment. Due to its feeding habits, the species may cause natural populations to become extinct within a few years. Due to its feeding habits, the species may cause natural populations to face extinction within a few years. O. mykiss, which is distributed in Germeçtepe Dam Lake, is one of the species that entered the environment later. However, considering the species characteristics and habitat, it is not expected to reproduce and form a population. In fact, it was observed that the smallest of the samples obtained was 12 cm in length. The samples belonging to this species are individuals that escaped from trout farms that are cultivated in the environment. Germeçtepe Dam Lake was established on the Şadibey Stream of the Daday Stream. When the species distributed in the Daday Stream are examined, it is possible to see species belonging to the genera Oxyneomachailus, Alburnoides, Alburnus, Capoeta, Squalius. Of these, species belonging to the Oxyneomachailus and Alburnoides taxa could not be obtained from the dam lake. With the construction of the dam lake, the species in question may not have had the chance to survive in the environment and may have become extinct. Before the construction of the dam, the biodiversity of the stream in question was

It is not possible to answer this question because it has not been studied. P. fluviatilis and C. carpio species, which are distributed in the Dam Lake, are not found in the Daday Stream.. This shows that these species, which were later introduced to the environment, have not yet been able to overcome the barrier structures associated with dams and irrigation water and enter the river network system. As a result, A. chalcoides, C. baliki, C. carpio and S. cf. pursakensis species belonging to the Cyprinidae family are present in the Germeçtepe Dam Lake. Also, P. fluviatilis species from the Percidae family and O. mykiss

مجلة السلام العلمية
ISSN:2788-6336

species from the Salmonidae family were sampled from the dam lake. A. chalcoides, C. baliki and S. cf. pursakensis are species that naturally spread in the environment. C. carpio, P. fluviatilis and O. mykiss species entered the dam lake as a result of human activities and P. fluviatilis and C. carpio species reproduced in the environment and formed a population. O. mykiss species is represented by individuals that escaped from fish production facilities and could not form a population.. It is thought that the P. fluviatilis species will soon put dramatic pressure on other populations. In fact, it was observed that it was the dominant species in the samples. For this reason, the P. fluviatilis population should be reduced and relevant public institutions should take measures to prevent it from spreading into the river network.

Kaynaklar:

Anonymous, 2008. National Biodiversity Strategy and Action Plan. Republic of Turkey Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks, Department of Nature Conservation, National Focal Point of the Convention on Biological Diversity, Tasarım Ofset Ankara.
Anonymous, 2012. 23rd Regional Directorate 2012 Investment Program and

Budget Presentation Report. Republic of Turkey Ministry of Forestry and Water Affairs General Directorate of State Hydraulic Works Kastamonu.
Anonymous, 2018a.
http://researcharchive.calacademy
.org/research/ichthyology/catalog/ SpeciesByFamily.asp (2018.09.12).
Anonymous, 2018b
http://www.iucnredlist.org/search (2018.09.12)
Anonymous, 2018c.
http://www.fishbase.org/search. php (2018.09.12)
Bektas, Y., Turan, D., Aksu, I., Ciftci, Y., Eroglu, O., Kalayci, G., Belduz.,
A. O., 2017. Molecular phylogeny of the genus Capoeta (Teleostei: Cyprinidae) in Anatolia, Turkey. Biochemical Systematics and Ecology 70 (2017) 80-94.Çiçek, E., Birecikligil, S. S., Frick, R., 2015. Freshwater fishes of Turkey: a revised and updated annotated checklist. Biharean Biologist 9 (2): 141-157.
Demir, N., 2009. Ichthyology. Nobel Publishing Distribution Trade Co. Ltd. Ankara.
Demirsoy, A., 2007. General Zoogeography and Türkiye Zoogeography “Animal Zoogeography”, Sixth Edition, Meteksan A.Ş. Ankara
Geldiay, R., Balık S., 2002. Turkish Freshwater Fishes. Ege University Faculty of Fisheries Publications No:46, Ege Vocational School Printing House, İzmir.
İbret, B. U., 1998. Water Resources of Kastamonu. Kastamonu Education Journal, Year: 4, Issue: 5, 147-160.
Kuru, M., Yerli, S. V., Mangıt, F., Ünlü,
E., Alp, A., 2014. Fish
Biodiversity in Inland Waters of Turkey. Journal of Academic Documents for Fisheries and Aquaculture 3: 93-120.

مجلة السلام العلمية
ISSN:2788-6336

Özdemir, F., 2015. Principle Components Analysis of Two Pairs of Barbels Species of the Genus Capoeta (Teleostei: Cyprinidae) in Turkey. Pakistan J. Zool., 47 (3): 753-762.
Saylar, Ö., 2001. General Status of Kastamonu Ponds in Terms of Fisheries. Proceedings of the First Kastamonu Culture Symposium (21-23 May 2000), 411-418.
Sen, G., Erkan Bugday, S., 2015. Areas Designated for Protection and Use in Various Statuses in Kastamonu Province. Kastamonu University, Forestry Faculty Journal, 15 (2) 214-230.
Turan D, Kottelat M, Ekmekçi FG, Imamoğlu H. O., 2006. A review of Capoeta tinca, with descriptions of two new species from Turkey (Teleostei: Cyprinidae). Rev Suisse Zool 113: 421-436.