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The Biggest Black Sea Salmon (*Salmo labrax* PALLAS, 1814) in Turkey

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ABSTRACT

Salmonids are one of the species that is widely distributed in the world and have strong cultivation characteristics. Therefore, many studies have been conducted on the bioecological characteristics, culture characteristics, meat yield and quality of salmonid species. However, there are very few reports on the biggest known sizes of these species. This study was prepared to introduce the largest Black Sea salmon (*Salmo labrax* PALLAS, 1814) caught in the Black Sea Region of Turkey. In addition, this study is the first to introduce the largest Black Sea salmon in Turkey. The largest individual (16.5 kg) mentioned in our study was caught in Fırtına stream and the others in Borçka dam lake. The weight of the captured individuals from Borçka dam lake is 13.7 and 7 kg was measured respectively.

KEYWORDS: *Salmo labrax*, Black Sea, fisheries, the biggest size, Black Sea salmon

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1. Introduction

The Salmonidae family includes very popular fish species for the aquaculture industry (Aydın and Yandı, 2002). The first aquaculture study of brown trout from Salmonidae was carried out by Jacobi in Germany in 1739 for Europe. The first artificial fertilization and incubation for trout were achieved successfully in this study (Bromage and Roberts, 1995). Brown trout are preferred in aquaculture due to their beautiful appearance, taste and high economic value in our country as in European countries. Black Sea salmon is a subspecies of brown trout (Tabak et al., 2001), and it also is among the biggest forms of migratory salmonid species (Nikandrov and Shindavina, 2007). This species is represented by three different ecotypes, namely marine, stream and lake. Marine ecotype lives in the marine environment until reaching sexual maturity and migrates to the freshwater for reproduction. It remigrates to the sea after reproduction period (Tabak et al., 2001). The adaptation of the Black Sea salmon, which is among the endemic species of Turkey, to the cultural conditions was achieved with the studies started in 1998. After 2007, its cultivation started to become widespread and it is increasing in the whole country, especially in the Eastern Black Sea Region (Çakmak et al., 2011). The fish raised in hatchery were released for restocking into the Yanbolu stream along with these studies to determine the cultural characteristics of the species in Turkey (Çakmak et al., 2007; Çakmak et al., 2010). Similarly, Nikandrov and Shindavina (2007) reported that the offspring obtained by natural broodstock in the hatchery in Abkhazia were used to support the natural stocks of the Chernaya, Bzyb, and Kodori rivers between 1935-1958 years.

Stream ponds, dam lake net cages and sea net cage systems are used in aquaculture. Maximum growth in the natural environment is an important selection criterion for aquaculture. Large fish were also sampled in the natural sampling studies carried out to determine the culture potential of the Black Sea salmon. However, in the following years, the fact that large fish were not found in the rivers (Fırtına, Çağlayan, Kapistre, Solaklı, Baltacı and İyidere) where the species was naturally distributed raises the question that the species is in danger of extinction.

2. Material and Methods

Sampling studies were carried out in the Fırtına, Çağlayan, Kapistre, Solaklı, Baltacı and İyidere streams and the marine area under the influence of these rivers between 1998-2001 (Figure 1). In these studies, gillnet (length 150m, depth 2m, mesh 18-30mm), cast nets (diameter 3.5m, weight 7.5kg, mesh 35mm) and fish traps were used (Figure 2) (Tabak et al., 2001). Fishing with fish traps in streams where the species is naturally found has been followed since 2001. In addition, fishing has also been followed in the sea and dam lakes where the species is grown in net cages. Black Sea salmon culture in net cages in Borçka Dam Lake started in 2016 (Figure 1). Fishing with fishing line in the dam lake has been followed as well. The data on big Black Sea salmon individuals encountered during this monitoring period were collected and evaluated in this study.

Figure 1. The streams where Black Sea salmon fishing is followed.

Figure 2. Fishing equipment used in sampling from the natural environment (a: gillnet, b: cast net, c: fish trap, d: fishing line).

3. Results and Discussion

The fishery of the species in its natural distribution area was also followed while studies were carried out to determine the bioecological and cultural characteristics of the Black Sea salmon, which was initiated by the Central Fisheries Research Institute in 1998. The first big fish sample was caught in November 1999, 8 km from the downstream of the Fırtına Stream, using a fish trap. This fish has an obvious marine ecotype (anadromous) character and has the largest size (98 cm, 16.5 kg) ever caught in Turkey (Figure 3a). Illegal fishing using fish traps was followed in the rivers where the species was distributed, especially during the migration seasons, but similar sized fish were not found in the following years. Migratory (marine ecotype) forms have been encountered until 2009, especially in the Fırtına Stream, where the species is most densely distributed. However, no migratory individuals were caught in the following years. Hydroelectric plants (HEP) have been constructed in all streams except Fırtına Stream, which is the natural breeding ground of the species in the last ten years, so that the migration routes of the species have been blocked. In addition to HEP constructions in all rivers; sand-gravel quarries, river rehabilitation works, flood and overflow prevention sets and stream material procurement studies are still continuing. These studies carried out in the stream bed have affected the migration of the species and have reached dimensions that threaten the extinction of the population migrating to the sea.

Black Sea salmon farming has become widespread in the Eastern Black Sea Region with the project named "Introduction of Black Sea Salmon to the Private Sector", initiated by the Central Fisheries Research Institute in 2007. Stream ponds, dam lake and sea net cage systems can be used individually or as a chain in Black Sea salmon production taking into account appropriate water quality in the region. Although fish escape from aquaculture systems to the natural environment has been greatly reduced with the new technology, it is not possible to prevent it completely. Escape of fish is much more common especially in the cage systems, which are under the influence of environmental conditions in dam lakes. Borçka dam lake, where Black Sea salmon farming is carried out intensively, can be shown as an example of these experiences. Fishing with line fishing is followed in Kürtün, Torul, Topçam and Borçka dam lakes, where Black Sea salmon are reared in net cages. The largest individuals (Female: 7 kg, Male: 13.7 kg, 99 cm) caught in the dam lakes where fishing has been followed until today are in Borçka dam lake (Figure 3b, 3c).

Black Sea salmon spend most of their life in the sea, they live in the sea for feeding and growing, and migrate to inland waters for breeding and they return to the sea after laying their eggs (Kocabaş, 2009). However, it is suggested that Fırtına Stream is one of the most

important spawning areas of migratory Black Sea salmon (Gündüz et al., 1988). It has been reported by different researchers that this species is naturally distributed in the northwestern, northern and eastern parts of the Black Sea (Nikandrov and Shindavina, 2007). In the meantime, it was determined that the species was naturally distributed in the streams between Giresun and Artvin provinces in the studies we conducted on the Turkish coasts of the Black Sea from 1998 to 2002. However, it was observed that this fish is only found in the Fırtına and Çağlayan streams of Turkey today, as a result of the narrowing of the distribution area of the anadromous form. Similarly, Solomon (2000) reported that Black Sea salmon is found in most of the rivers flowing into the Black Sea and the Sea of Azov, but its natural distribution area has decreased due to anthropogenic activities. Also, the known migratory populations occur in several rivers in Georgia's Acarya and Abkhazia regions, and possibly in several Russian and Turkish rivers; and the situation elsewhere in the region is uncertain. Black Sea salmon (*Salmo labrax*) is reported to be found in coastal waters and streams in the Trabzon region (Barach, 1962; Svetovidov, 1964). Today, it is reported that the Black Sea salmon stocks show a decreasing structure due to human activities (environmental pollution, fishing, settlement, stream improvement works, dam constructions) and they are caught uncontrolled during the migration period and they are protected under the law about fishing bans published in 1982 (Tabak et al., 2001).

Black Sea salmon can grow up to 100 cm in length and 26 kg in weight in Black Sea (Kocabaş, 2009). In conducted studies, different results were obtained regarding the largest size or weight of the Black Sea salmon. Of these, Barach (1962) reported that the female Black Sea salmon caught in the Kodori river weighed 16.7 kg and 116 cm long. Similarly, Solomon (2000) reported that Black Sea salmon, which came from fishing and was offered for sale in the Batumi markets in different months as the largest size, weighing 16 kg. Kottelat and Freyhof (2007) reports the size of the largest Black Sea salmon as 80 cm. Aksungur et al. (2011) reported that the largest fish caught was 96 cm in length and 12.11 kg in weight, in their sampling study in rivers where the Black Sea salmon was naturally distributed. Similarly, Nikandrov and Shindavina (2007) stated that Black Sea salmon individuals that reached up to 24 kg were found in the Kodori river.

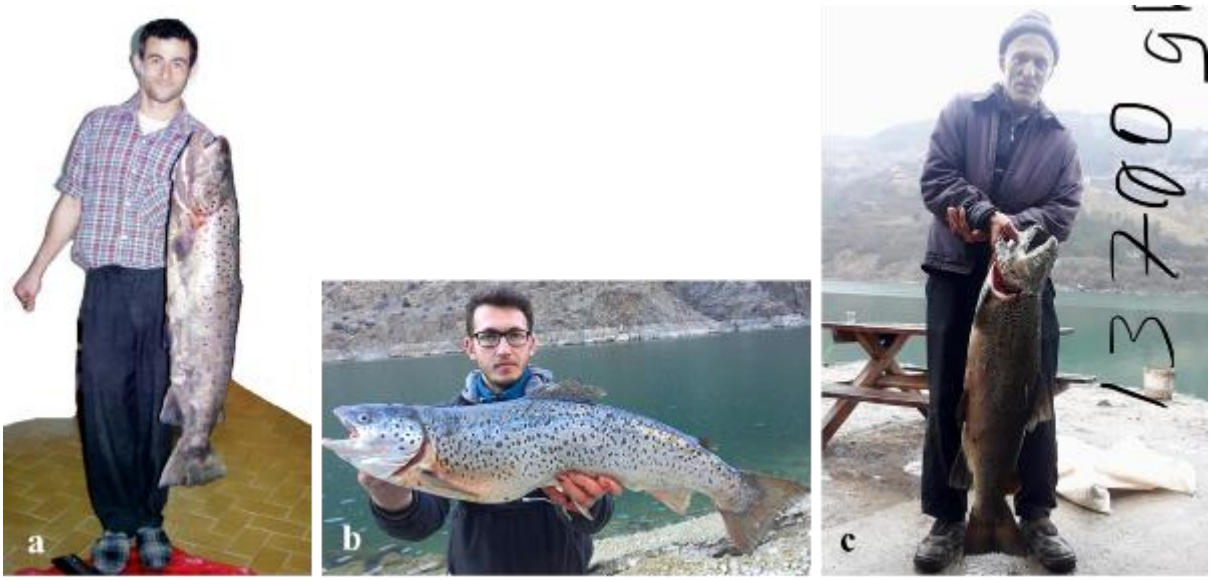

Figure 3. Biggest Black Sea salmon individuals caught from the natural environment (**a**: Karabulut, 1999., **b**: Eryılmaz, 2020., **c**: Kuzuoğlu, 2021)

Three large fish obtained from the natural environment were deemed worthy of evaluation in this study. One of these fish was caught from Fırtına Stream (Fig. 3a), and the other two were from Borçka Dam Lake (Fig. 3b, 3c). It is highly probable that the fish obtained from Borçka Dam Lake are cultural forms.

The findings obtained in this study coincide with the findings of natural large fish caught in Abkhazia and Adjara Regions, which were the natural habitat of the species in the past years. The absence of large fish after 2000 in the rivers in the Eastern Black Sea Region of Turkey, which is one of the natural distribution areas of the species, can be considered as an indication that the anadromous population is under threat. It is seen that the natural stocks of anadromous Black Sea salmon are affected by dam constructions, river improvement works and sand-gravel quarries, the numbers of which are increasing day by day. Also individuals which migrate to fresh waters to breed cannot reach their spawning areas due to these activities. Today, it is important to determine the current status of natural stocks of Black Sea salmon, which is still in the category of least concern in the IUCN Red List, and to ensure the continuation of their generation. It is important to establish a commission for the investigation and solution of this problem by all the countries bordering the Black Sea. If deemed necessary, restocking studies should be carried out through this commission.

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