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Short Communication

Annual fishable stock quantity respects to economic fish species in Kiğı and Yukarı Kaleköy Dam Lake (Bingöl, Türkiye)

Abdulmutalip Beri[a], Nurgül Şen Özdemir[b]*, Kadir Miraç Daşbilek[a]

[a]Bingöl Directorate of Provincial Agriculture and Forestry, Republic of Türkiye Ministry of Agriculture and Forestry, 12000-Bingöl, Türkiye

[b]Department of Veterinary Medicine, Vocational School of Food, Agriculture and Livestock, Bingöl University, 12000-Bingöl, Türkiye

*Corresponding author: nsozdemir@bingol.edu.tr

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Abstract

It was targeted to estimation of fish stocks in Kiğı and Yukarı Kaleköy Dam lakes in (Bingöl, Türkiye). The annual estimation of fishanable stocks was 14.37 kg/year for Kiğı Dam Lake and 13.63 kg/year for Yukarı Kaleköy Dam Lake. The difference between the locations was statistically insignificant in total biomass ($p>0.05$). However, there were statistically significant between fish species, especially *Cyprinus carpio, Squalius* sp., and *Capoeta damascina* ($p<0.05$).

Keywords: Fish stock, Kiğı Dam Lake, Yukarı Kaleköy Dam Lake

INTRODUCTION

Fisheries management is possible with the basic condition such as the availability of necessary population data (Wolos & Wisniewolski, 2009). Knowledge of the ecology and life histories of fish stocks are prerequisites for fisheries management. Stock assessment includes study of population dynamics controlled by growth, recruitment, natural mortality, and fishing mortality (King, 1995). Fish stocks are reduced in size when the gains from spawning, recruitment and individual growth are smaller than losses from natural and fisheries mortality. Catching is usually the main cause of natural deaths, but other factors such as starvation, diseases, dramatic environmental fluctuations such as oxygen depletion, increase/decrease in water temperature and other water quality parameters can also be effective. Studying the population dynamics of fish stocks in aquatic resources is necessary to understand the response of species to ecosystem manipulation or perturbations, to analyze the economic effects of changes in population sizes over time, and to achieve population viability and Maximum Sustainable Yield (MSY) (Tesfaye & Wolff, 2015).

Fishing activities are carried out in Türkiye that serve many purposes such as rationally evaluating the existing inland water resources, preventing the destruction caused by catching, and providing fish, which is a rich protein source, to people as food. In addition, It is aimed to the improvement, development, enrichment and reinforcement of natural stocks, biological control, the development of fisheries production and sportive catching by increasing the fish population with catching in inland waters. Therefore, fishing studies were carried out in Kiğı and Yukarı Kaleköy Dam Lake between July and October in 2020 and 2021 .

In order to implement an effective fisheries management and biological protection, stock sizes should be evaluated and then maximum sustainable yield and catch efforts should be determined for each fish population (Çoban et al., 2013). Kiğı and Yukarı Kaleköy Dam Lakes will be opened for hunting for the first time. Therefore, it may create an intense catching pressure on the catching area. In order to determine the quantity of stock in the Kiğı and Yukarı Kaleköy Dam Lake catching area, the field scanning method proposed by various researchers (Pauly, 1980; Bingel, 1981; 1985; 1987; Sparre et al. 1989; Avşar, 1999) was determined by Avşar et al. (2001) used the "Catching Method with Elongation Nets", a version of which it was applied to gillnets. The reservoir areas are 804.8 ha for Kiğı Dam Lake and 1086 ha for Yukarı Kaleköy Dam Lake.

Firstly, it is aimed to determine the annual catchable stock for the Kiğı and Yukarı Kaleköy Dam Lake catching area, taking into account the time of the fish to reach sexual maturity as a result of retrospective fisheries studies due to the newness of the dam lakes. Secondly, it is aimed to determine the fishing technical conditions that must be followed in order to keep the yield at the highest level during the determination of the species and quantities of the fish populations in the

reservoir with the stock determination studies in the Kiğı and Yukarı Kaleköy Dam Lake, Bingöl (Türkiye).

MATERIAL AND METHODS

Study Area

Kiğı Dam Lake is within the borders of Bingöl province, Kiğı District. According to the data received from DSI 94th Branch Directorate, the minimum operating level of the Kiğı Dam Lake is 1307 m, the reservoir area of the dam lake at this elevation is 4.048 km^2, the maximum operating level is 1365 m, and the catching area of the dam lake at this elevation is 804.80 ha.

Yukarı Kaleköy Dam Lake is located within the borders of Bingöl Province, Solhan District. Yukarı Kaleköy Dam Lake site is located on the Murat River at 1102.5 m elevation. The catchment area of Yukarı Kaleköy Dam Lake is 21.370 km^2. The hunting area has an area of 1086 ha. The catching areas were measured by a digital area-meter.

Sampling and Data Collection

This study was conducted between August 2021 and March 2022. In the catching experiments, plain fishing line extension gillnets used in the stock application are 40, 50, 55, 60 and 75 mm. They are 100 m, 200 m and 300 m long gillnets.

For the estimation of catchable stock, stations were determined and sampling studies were carried out by considering different yields in the determination of the reservoir area. In this study, plain fishing line extension nets with different mesh sizes from 40 mm to 75 mm were used. The biometrics of the fish coming out of the nets were made separately according to the meshes. The total lengths of the caught fish samples were measured with a millimetric measuring board, and their weights were weighed with a balance with an accuracy of 0.1 g.

(1) N = A/a. y

N=Stock weight (kg)

A=Total area (m^2;ha)

a=Surface area of gillnet (m^2)

y= Average weight of all fish caught at all fishing trials (kg)

a=E.B

E=Witdth of gillnet (mm)

B= Length of gillnet (m)

(2) y=Ba/n

Ba= Weight of the each fish caught at fishing region (m^2; ha)

n= Number of hunting (n=6)

(3) k=TW/n

k=The fish species coefficient

FSA=Nxk/y

FSA= Fishable stock amounts for every species (kg/year)

The observed differences were evaluated statistically using MINITAB software. Statistical differences were tested between the locations using a one-way analysis of variance (ANOVA) test with $p<0.05$.

RESULTS

This study has been carried out in different fishing areas with 6 catching in Kiğı and 7 catching Yukarı Kaleköy Dam Lake.

Fishing studies are carried out that serve many purposes such as rationally evaluating the existing inland water resources, preventing the destruction caused by catching, and offering fish, which is a rich protein source, to people more as food. In addition to the improvement, development, enrichment and reinforcement of natural stocks, biological control and biological control are aimed together with the development of fisheries production and sportive catching by increasing the fish population with the fishing of water resources. The fishing activities carried out in Kiğı and Yukarı Kaleköy Dam Lake are given Table 1.

Table 1. The fishing activities carried out in Kiğı and Yukarı Kaleköy Dam Lake in 2020 and 2021

Year	Species	Amount (individual number)	
		Kiğı	Yukarı kaleköy
2020	*Cyprinus carpio*	200.000	100.000
2021	*Cyprinus carpio*	80.000	116.750
Total	***Cyprinus carpio***	**280.000**	**216.750**

Table 2. Total surface area of gillnets (m^2) used in Kiğı Dam Lake

Gillnet mesh size (mm)	Gillnet Lenght (m)	Half lenght (m)	Full lenght (m)	Surface area of gillnets (m^2)
40	100	3.464*	6.928	346.4
50	300	4.33	8.66*	2598
55	100	4.763*	9.526	476.3
55	200	4.763	9.526*	1905.2
60	200	5.196	10.392*	2078.4
75	100	6.495*	12.99	649.5
Total surface area of gillnets (m^2; ha)			**8.053,8 m^2 ; 0,80538 ha.**	

*The size of the gillnets used

Table 3. Total surface area of gillnets (m^2; ha) used in Yukarı Kaleköy Dam Lake

Gillnet mesh size (mm)	Gillnet Lenght (m)	Half lenght (m)	Surface area of gillnets (m^2)
40	300	3.464	1039.2
55	200	4.763	952.6
60	200	5.196	1039.2
75	100	6.495	649.5
90	100	7.794	779.4
Total surface area of gillnets (m^2; ha)		**4.459.9 m^2 ; 0.44599 ha**	

It is thought that there will be an intense catching pressure, since the dam lakes will be opened for catching for the first time. In addition, due to the newness of the dam lake, taking into account the time of the fish to reach sexual maturity as a result of retrospective fisheries studies. In addition, it was deemed appropriate to accept the level of utilization from the stock as 0.3 due to the newness of these dam lakes, as a result of retrospective fisheries studies, considering the time of the fish to reach sexual maturity.

Total catching amounts estimated fishable stock in total area of the economic fish species of Kiğı Dam lake that have been *Cyprinus carpio* (Common carp) *Capoeta damascina* (Siraz-Yellow fish), *Squalius sp*. (Chub) and *Capoeta trutta* (catfish). Their annual catchable stock estimates are given in Table 4. *Cyprinus carpio* (Common carp) *Capoeta damascina* (Siraz-Yellow fish), *Squalius* sp. (Chub) and *Luciobarbus barbulus* (Barbell) were economic fish species used in the annual stock estimation of the Yukarı Kaleköy Dam Lake (Table 5).

16.72 kg of *C. carpio*, 15.81 kg of *Capoeta damascina*, 217.06 kg of *Squalius* sp. and 38.08 kg of *Capoeta trutta* were taken from gillnets thrown into the hunting area in Kiğı Dam Lake. A total of 287.67 kg of fish were identified and the annual average weight of fish caught at all fishing trials was 47.95 kg/year. Stock weight was found 47.91 kg and annual catched stock amount was 14.37 kg/year.

55.861 kg *C. carpio*, 21.82 kg *C. damascina*, 35.125 kg *Squalius* sp. and 17.840 kg *L. barbulus* were taken from gillnets thrown into the catching area in Yukarı Kaleköy Dam Lake. A total of 130.65 kg kg of fish were identified and the annual average weight of fish caught at all fishing trials was 18.66 kg. Stock weight was found 45.45 kg and annual catched stock amount was 13.63 kg/year. Consequently, the annual recommended amount of catchable fish is 14.37 kg/year for Kiğı Dam Lake and 13.63 kg/year for Yukarı Kaleköy Dam Lake.

Table 4. Fishable stock quantity to economic fish species in Kiğı Dam Lake

Fish species	Fishable stock quantity (kg/year)
Cyprinus carpio (Common carp)	835
Squalius sp. (Chub)	10845
Capoeta damascina (Siraz, yellow fish)	790
Capoeta trutta (Blackfish)	1903
TOTAL	**14373**

Table 5. Fishable stock quanity to economic fish species in Yukarı Kaleköy Dam Lake

Fish species	Fishable stock quantity (kg year^{-1})
Cyprinus carpio (Common carp)	5829
Squalius sp. (Chub)	3665
Capoeta damascina (Siraz, yellow fish)	2277
*Luciobarbus barbulus (*Barbell)	1861
TOTAL	**13632**

The difference between the estimated fishable stock quantity was statistically insignificant in total biomass for both of the locations ($p>0.05$). However the difference between fish species was statistically significant *C. carpio, Squalius sp., and C. damascina* in these locations ($p<0.05$).

DISCUSSION

In this study, annual fishable stock of Kiğı and Yukarı Kaleköy Dam lakes in Bingöl, Türkiye in 2021-2022 fishing season. This study is the first stock estimation research in the Bingöl Dam Lakes, although in different areas of Türkiye such as Karakaya Dam Lake (Anul, 1995; Kalkan, 2008; Yüksel & Celayir, 2010), Seyhan Dam Lake (Avşar et al., 2001; Özyurt et al., 2004; Çiçek et al., 2006).

Fish stocks are affected by natural death and the death of fisheries. The structure of a fish stock that has never been caught changes when it is caught (Yuksel & Celayir, 2010). In the beginning, an increase in the product is observed with increased hunting, but then a decrease is observed in the product despite the increase in catching efforts (Bingel, 2002).

It was detected 287.67 kg in Kiğı Dam Lake and 130.65 kg in Yukari Kaleköy Dam Lake during the catching period. Annual fishable stock quantity were 14.37 kg/year for Kiğı Dam Lake and 13.63 kg/year for Yukarı Kaleköy Dam Lake.

Stock estimation is important in inland fisheries management. However, it is suggested that the studies should be repeated at certain intervals, since it is important to compare the amounts of fish obtained by catching to give better results (Yüksel & Celayir, 2010). They provide scientific advice to decision makers about the current health and future trends of a fish stock and fisheries. The assessments also provide a technical basis for determining annual fisheries harvest levels (via quotas and catch limits) and other fisheries management measures (Fisheries, 2012). Therefore, this study, which is a preliminary research, we think that it will be useful for researchers who will investigate in this locations to fish stock estimation studies by dividing these dam lakes into sub-regions, to understand the fish stocks of the locations and to see the changes.

Author Contributes

Authors contributed equally to this paper.

Conflict of interest

The authors declare no conflict of interest for this study.

Ethical approval

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

Data Availability

All data generated or analysed during this study are included in this published article.

ORCID ID:

Abdulmutalip Beri: https://orcid.org/0009-0006-2585-4258

Nurgül Şen Özdemir: https://orcid.org/0000-0001-6656-822X

Kadir Miraç Daşbilek: https://orcid.org/0009-0000-1706-2708

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