Kafkas Univ Vet Fak Derg
16 (Suppl-B): S179-S182, 2010
DOI:10.9775/kvfd.2009.372

RESEARCH ARTICLE

# Reproductive Biology of *Capoeta tinca* Inhabiting Kayaboğazı Dam Lake (North-West Anatolia, Turkey)

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**Makale Kodu (Article Code): KVFD-2009-372**

## Summary

This study investigates the reproduction biology of *Capoeta tinca* population in Kayaboğazı Dam Lake in the region of Northwest Anatolia in Turkey (Kütahya). The investigation was carried out between March and December 2003. During the study, breeding and sexual maturation properties of *Capoeta tinca* were studied. The sexual maturity position for both sexes were II age. The spawning period was from begining of May to the end of June. The minimum fishing size was found as 214 mm in terms of fork length. According to age, the reproduction period was changing between different populations depending on ecological conditions in Turkey's areas.

**Keywords:** *Capoeta tinca, Reproduction biology, Kayaboğazı Dam Lake, Turkey*

# Kayaboğazı Baraj Gölü (Kuzey Batı Anadolu -Türkiye)'nde Yaşayan *Capoeta tinca'* nın Üreme Biyolojisi

## Özet

Bu çalışmada Kuzey Batı Anadolu Bölgesi(Türkiye)'nde yer alan Kayaboğazı Baraj Gölü'ndeki *Capoeta tinca* populasyonunun üreme biyolojisi incelenmiştir. Araştırma Mart ile Kasım 2003 tarihleri arasında gerçekleştirilmiştir. Çalışma süresince *Capoeta tinca*'nın eşeysel olgunluk ve yumurta bırakma dönemleri incelenmiştir. Eşeysel olgunluğa ulaşma yaşı, erkek ve dişi cinsiyetler için II olarak belirlenmiştir. Üreme periyodu Mayıs başlangcından Haziran sonuna kadar olan dönemi kapsamaktadır. En küçük av büyüklüğünün (çatal boy olarak) 214 mm olduğu tespit edilmiştir. Türkiye'nin farklı bölgelerinde değişen ekolojik şartlar nedeniyle, üreme periyodunun yaşa bağlı olarak populasyonlar arasında farklılıklar gösterdiği anlaşılmıştır.

**Anahtar sözcükler:** *Capoeta tinca, Üreme biyolojisi, Kayaboğazı Baraj Gölü, Türkiye*

## INTRODUCTION

*Capoeta tinca* has a wide distribution in North and Northwest Anatolia of Turkey and lives in systems that are hydrologically connected to the Black Sea [1,2]. Becuase of its delicious flesh, people perfer this species to consume as food and it is so important commercially in Turkey [2]. *Capoeta tinca* can easily adapt to the changing conditions in any aquatic system, it occurs in lotic and lentic habitats both, caught as a commercial fish from natural and man-made lakes [3]. There are some limited studies concerning *C. tinca* by some researchers in Turkey [4-11].

Present study, basically undertakes the reproduction of *Capoeta tinca* population in Kayaboğazı Dam Lake on Kocasu (Adranos) stream in the Susurluk basin in Kütahya province in the North-West Anatolia.

## MATERIAL and METHODS

The Kayaboğazı Dam Lake is located on Tavşanlı plain (39°21´ and 39°35´N- 29°23´and 29°37´E) *(Fig 1)*. This study was made between March and December 2003 in Kayaboğazı Dam Lake. Water sampling and its evaluation

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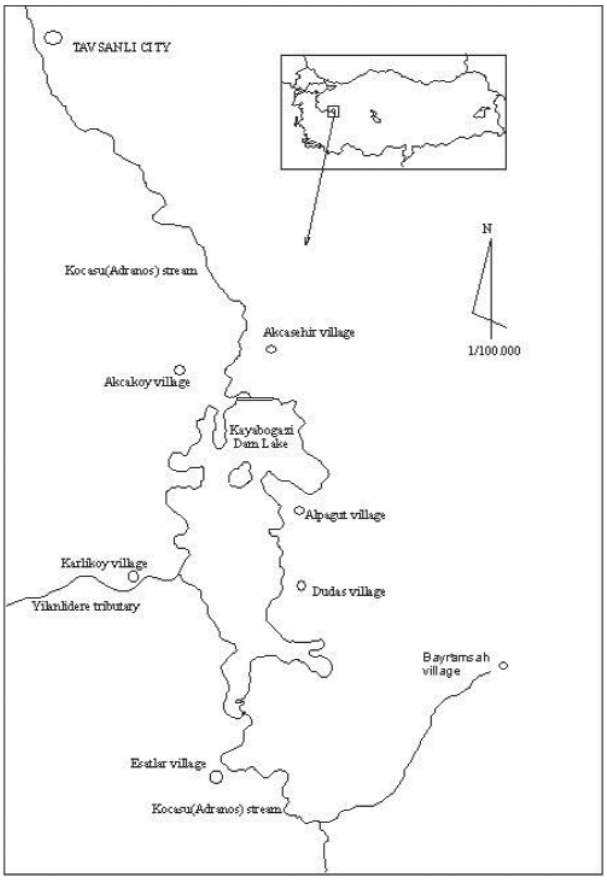


**Fig 1.** Map of Kayaboğazı Dam Lake
**Şekil 1.** Kayaboğazı Baraj Gölü'nün haritası

was made in situ using WTW model oxgygen meter, and conductivmeter in every stations as unit of °C, mg/L and µmho/cm for each parameters, conveniently.

Sampling was performed with gill nets of various mesh sizes (18, 24, 36, 44 and 60 mm knot to knot). In the laboratory, body weight and fork length of each individuals were measured with a precision of 0.01 g and 0.1 cm, respectively. Scales taking from under dorsal fin were used for age determination [12]. Sexual characteristics in this species were determined on gonadal tissues naked eye or using a lens (x10) [13]. Males differ from females morphologically by the presence of breeding tubercules on the head during spawning period. The sexual maturity was determined in gonads under binocular microscope. Gonadosomatic indexes (GSI) were calculated as: GSI = Gonad weight x 100/total body weight.

Seasonal changes in GSI, egg diameter and number of eggs per gram of ovary were used to determine the reproduction biology of this species. The diameter of each ripening ovum was measured by means of compasses to the nearest 0.01 mm in compass.

Minimum of 25 ova selected from different parts of the ovary (proximal, middle and distal) were measured. The number of eggs was estimated by gravimetric methods [14] . In this study, regression analyse was used to determine the relationship between fecundity (F) and body weight (W) or Length (L) [15]. Maturity age was determined on gonads by opening the ventral cavity between April and July term [14].

***Table 1.*** *The means with the standard error of gonadosomatic index values, mean egg diameter and number of Capoeta tinca living in Kayaboğazı dam lake*

***Tablo 1.*** *Kayaboğazı Baraj Gölü'nde yaşayan Capoeta tinca'nın gonadosomatik indeksi, ortalama yumurta çapı ve sayıları ile standart hataları*

| Months | GSI X±Sx | Egg diameter (mm) X±Sx | Egg number/1 g X±Sx |
|---|---|---|---|
| March | 2.85±0.64 | 0.88±0.078 | 1420±398.62 |
| April | 3.93±0.70 | 0.95±0.064 | 1352±242.36 |
| May | 5.55±0.99 | 1.387±0.095 | 1014±172.87 |
| June | 3.50±0.67 | 1.065±0.074 | 1076±221.27 |
| July | 1.14±0.07 | 0.56±0.063 | 1120±120.00 |
| August | 1.41±0.04 | 0.58±0.059 | 1150±135.68 |
| September | 1.42±0.13 | 0.65±0.076 | 1170±270.64 |
| October | 1.54±0.05 | 0.75±0.089 | 1260±83.33 |
| November | 2.30±0.57 | 0.77±0.042 | 1340±119.22 |
| December | 2.40±0.20 | 0.84±0.034 | 1380±91.39 |

## RESULTS

Water temperature and dissolved oxygen and electrical conductivity ranged from 4.7°C to 20.6°C, 6.48 mg/l to 9.23 mg/l and 374.10 µmho/cm to 510.24 µmho/cm in this lake, respectively.

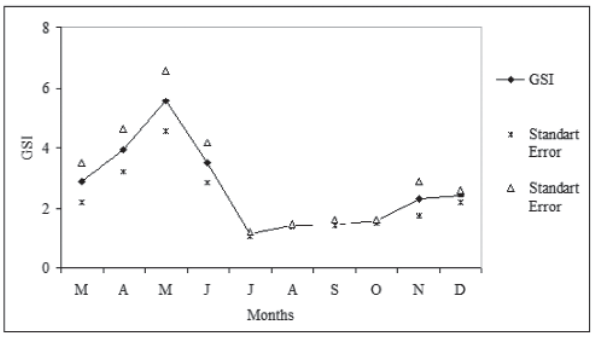


**Fig 2.** Seasonal changes in GSI of *Capoeta tinca* in Kayaboğazı Dam Lake
**Şekil 2.** Kayaboğazı Baraj Gölü'ndeki *Capoeta tinca*'nın GSI değerlerinin mevsimsel değişimi

Gonadosomatic index values, mean egg diameter and number of *Capoeta tinca* in Kayaboğazı Dam Lake were given in *Table 1.* Some findings for reproduction biology of *C. tinca* from different locations in Turkey were given in *Table 2.*

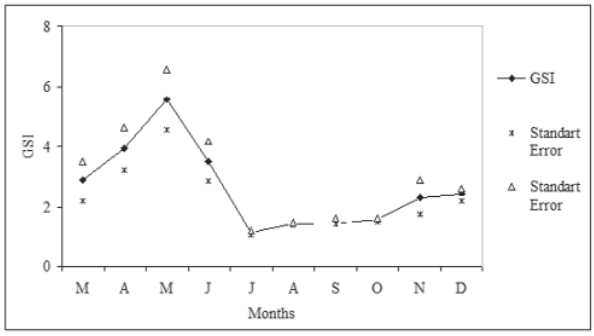


**Fig 3.** Seasonal changes in egg diameter and number of *Capoeta tinca* in Kayaboğazı Dam Lake

**Şekil 3.** Kayaboğazı Baraj Gölü'ndeki *Capoeta tinca*' nın yumurta çapı ve sayılarının mevsimsel değişimi

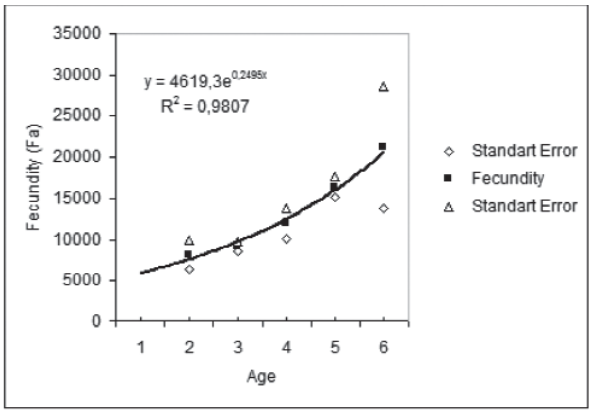


**Fig 4.** Age-fecundity relation of *Capoeta tinca* in Kayaboğazı Dam Lake

**Şekil 4.** Kayaboğazı Baraj Gölü'ndeki *Capoeta tinca*'nın yaş-fecundite ilişkisi

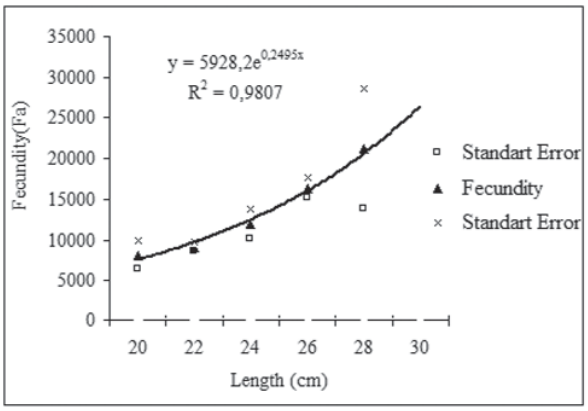


**Fig 5.** Length-fecundity relation of *Capoeta tinca* in Kayaboğazı Dam Lake

**Şekil 5.** Kayaboğazı Baraj Gölü'ndeki *Capoeta tinca*'nın boy-fecundite ilişkisi

Both sexes attained sexual maturity in the second year and spawning took place from the begining of May to the end of June in Kayaboğazı Dam Lake *(Fig 2* and *3)*.

A high correlation was found between age-fecundity and length-fecundity *(Fig 4* and *5)*.

## DISCUSSION

In this study, both sexes of *Capoeta tinca* attained sexual maturity at second year was determined in Kayaboğazı Dam Lake. This result was similar with those of Akgül's results in Kelkit stream in vicinity of eastern Black Sea and Bircan and Aral's results in Altınkaya Dam Lake in Bafra-Samsun *(Table 2)* [5,16].

***Table 2.*** *Some findings for reproductive biology of Capoeta tinca from different regions in Turkey*
***Tablo 2.*** *Türkiye'nin farklı bölgelerinden Capoeta tinca'nın üreme biyolojisi ile ilgili bazı bulgular*

| Spawning Period | Temperature (°C) | Maturity Age (Male/Female) | Study Area | References |
|---|---|---|---|---|
| June-July | - | III/II | Kızılırmak river (Central Anatolia) | 4 |
| July-September | - | II/II | Kelkit Stream (Vicinity of Eastern Black Sea) | 5 |
| April-June | - | II/II | Altınkaya Dam (Bafra-Samsun) | 16 |
| July to September | - | II/III | Kızılırmak basin (Central Anatolia) | 18 |
| May-July | 15.3, 22.5 | III-IV/IV-V | Sarıyar Dam (Central Anatolia) | 6 |
| May and June | 19.0 | II/III | Gelingüllü Dam (Central Anatolia) | 10 |
| May-June | - | II/III | Çoruh Basin (Eastern Anatolia) | 20 |
| May to June | - | III/IV | Kapulukaya Dam (Kırıkkale) | 19 |
| May-July | 16.0 | II/III | Oltu Stream (Eastern Anatolia) | 9 |
| May-July | - | II/III | Kirmir Stream (Central Anatolia) | 8 |
| Beginning of May, end of June | 15.0, 21.0 | II/II | Kayaboğazı Dam (NorthwestAnatolia) | present study |

The result of sexual maturity in our study was different from findings of some authors *(Table 2).* Many factors such as physicochemical, bio-ecological and climatical factors may have effect as direct and indirect, attaining sexual maturity of fish [17]. The differencies of findings of some authors can be taken root from temperature and feeding conditions in different water systems [4,6,10].

With purpose of determining the spawning time was used GSI values, egg diameter and direct observation of gonad maturity of *C. tinca* in the dam lake. Spawning phenomenon took place from begining of May to the end of June in this dam. Climatical discrepancies have shown different table in different area of Turkey. Hence, same species can appear different biological behavior from area to area in Turkey. For example: As seen *Table 2*, findings of Akgül [4,5], Ekmekçi [6], Yılmaz and Gül [7], Yıldırım and Aras [9], Ekmekçi and Özeren [10], Bircan and Aral [16], Erk'akan and Akgül [18], Yılmaz [19], about spawning period for *C. tinca* populations were different from our results. But, findings of Solak [20], were similar to our study's results. Briefly, we can express as follow in *Table 2.*

Water temperature results during the spawning period of *C. tinca* in Kayaboğazı Dam Lake were similar to the results of Yıldırım and Aras [9], Ekmekçi and Özeren's [10], findings *(Table 2).*

We have some suggestions concerning fishing legality in area:

1- Minimum fork length for fishing must be 214 mm (both sexes).

2- Fishing period must be limited to be forbidden between out of May beginning and up to end of June for *C. tinca* population in this lake.

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