

The Reproductive Biology of the Tench *Tinca tinca* (L., 1758) in Seyhan Reservoir (Adana, Turkey)

Sibel Alagoz Erguden and Munir Ziya Lugal Goksu
Faculty of Fisheries, Cukurova University, Adana, Turkey

Abstract: Present study is concerned with the reproductive biology (maturity age, spawning time and fecundity) of *Tinca tinca* (L., 1758) population living Seyhan reservoir. It was determined that the fish reach the sexual maturity at the age of II and the spawning period starts in May and ends in August. It has been found that the fecundity varied between 7800 and 19560. The GSI value was the highest in June and lowest in August.

Key words: Tench, *Tinca tinca*, reproductive biology, Seyhan reservoir, fecundity, Turkey

INTRODUCTION

Tench, *Tinca tinca* (L., 1758) is a wide-spread cyprinid in Europe, Near-East and Siberia. The fish is lived in relatively shallow weedy lakes and slow flowing rivers. It is not of commercial importance because it is slow growth rate whereas, it is consumed locally. However, it is used for cleaning carp pools and aiding mineralization in aquatic systems of poly-culture and for this purposes, transplantation studies of tench have been conducted in areas of poor quality water in Turkey (Yilmaz, 2002). Previous researches on tench in Turkey and in the world are as follows: Lukowicz and Proske (1979), Horoszewicz (1983), Pimpicka (1991), Hubenova-Siderova *et al.* (1995), Perez-Regadera and Gemio (1995), Yilmaz (2002) and Benzer *et al.* (2007a, b) on reproductive biology of the species by O'Maoileidigh and Bracken (1989), Vetlugina (1992) and Altindag *et al.* (1998, 2002) on growth features by Alas and Ak (2007) on population structure by Balik *et al.* (2004) on structure, mortality and growth by Balik *et al.* (2009) structure, mortality, growth and estimated stock size by Erguden and Goksu (2010) on age, growth and sex ratio by Atasagun and Karabatak (1995), Benzer *et al.* (2007a, b, 2009) and Alas *et al.* (2010) on feeding biology.

The aim of this study was to examine on the reproduction biology of tench population in the Seyhan dam lake for the 1st time (Turkey).

MATERIALS AND METHODS

Study area: The present study was carried out in the Seyhan dam lake (37°03'38"N; 35°19'32"E), one of the most important reservoirs in the Mediterranean region in Turkey.

Sampling methods: A total 210 specimens (110 males and 100 females) of tench were collected monthly between January 2007 and December 2007. Fish samples were collected using trammel nets with various mesh sizes (18, 20, 25 and 28 mm). Fish samples were immediately preserved in 10% formalin and analyzed in the laboratory. The total length and total weight were measured 1.00 mm and 0.01 g, respectively. Scales were used for age determination according to Lagler (1966). The scales from the left side of the body between the lateral line and dorsal line and dorsal fin were gathered and analyzed (Lagler, 1966). Sex was determined by examination of the gonad tissue either with eye or the aid of lens (x10). The gonads were removed and weighed to the nearest 0.001 g. The monthly Gonado-Somatic Index (GSI) was calculated for each specimen as:

$$GSI = \frac{\text{Gonad weight}}{\text{Total body weight}} \times 100$$

The number of eggs was estimated by Gravimetric method from 92 female individuals. To determine the number of eggs, pieces were removed from the front, middle and back of the ovary.

The pieces were weighed and the eggs in them counted under a binocular microscope. The number of eggs in each female was calculated as the proportion of eggs in the sample to the weight of the whole ovary. The diameters of 30 eggs taken from the front, middle and back of the ovary were measured using micrometer scale (Yilmaz, 2002). The results have been evaluated statistically using Student's t test and Standard Deviation (SD) was calculated. Water temperature was measured by means of digital thermometer.

RESULTS AND DISCUSSION

Water temperature ranged from 20-31.6°C for the spawning period beginning of May end of August in Seyhan dam lake. The investigation of the main spawning period of tench was base on the GSI (Fig. 1). The highest GSI value occurred in June and the lowest in August. The numbers of mature and immature individuals are shown in Table 1. They reach the sexually maturity at the age of II in the Seyhan reservoir. Mean egg diameter was highest in June and smallest in August (Fig. 2). It was determined that egg diameter reached the maximum value

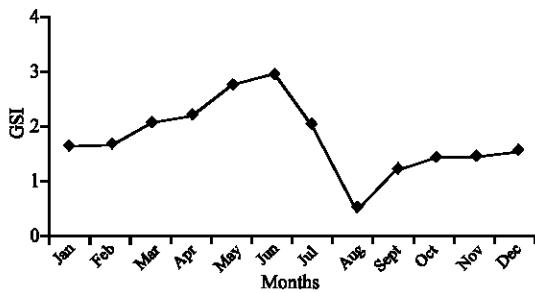


Fig. 1: Monthly variations in the GSI values of female of tench in Seyhan reservoir

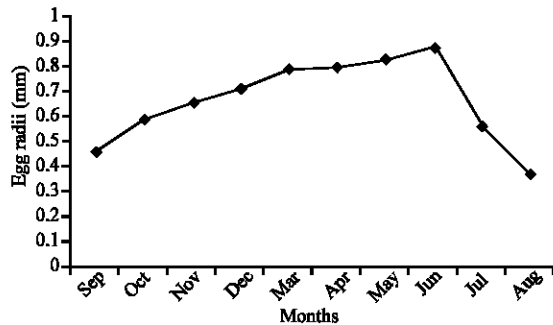


Fig. 2: Seasonal changes in egg diameter of tench in Seyhan reservoir

Table 1: Numbers of inmature and mature individuals in age groups I-V of tench in Seyhan reservoir

Sex	Age groups	I	II	III	IV	V
Females	Immature	4	-	-	-	-
	Mature	4	25	32	20	15
Males	Immature	28	-	-	-	-
	Mature	2	20	35	20	5

Table 2: The average weight, average length and fecundity of female tench according to age [N: Number of specimen, L: Length, W: Weight, Fec: Fecundity, SD: Standard Deviation]

Age	N	L±SD	W±SD	Fec±SD
II	25	18.18±1.212	100.0±17.48	7800±5228
III	32	21.34±0.793	145.0±17.50	12200±4914
IV	20	25.43±0.808	250.9±19.87	14500±4656
V	15	28.50±0.668	300.5±23.93	19560±5620

of 0.87 mm in June. During the spawning period, the length, weight and fecundity of 92 female tench were determined according to their age groups (Table 2). The fecundity was determined to range during the spawning season varied between 7800 and 19560 and increase with the age (Fig. 3). Although, it is generally accepted that sexual maturity of tench is not reached before 2-3 years of age. Rodriquez *et al.* (2004) conducted a successful experiment on artificial reproduction in 1 year old tench is described. The age distribution of the tench population for both sexes in the Seyhan reservoir ranged from I-V. In this study, both sexual maturities at 2nd year were determined in Seyhan reservoir. Neophitou (1993) reported that both sexes of tench population matured first at age 3+ in Lake Pamvotida.

This result was different from findings of some researchers in Turkey (Table 3). Many factors may have (biological, physicochemical, climatic, etc.) as direct and indirect effect, attaining sexual maturity of fish and may be at the different location water system (Nikolsky, 1963). Pimpicka (1991) and Neophitou (1993) reported fecundities on average of 314800 and 184000 eggs kg⁻¹ of fish, respectively. As shown in Table 3, findings results of other researchers in Turkey for tench populations were different from the present study. Temperature patterns over the pre-spawning period exerted a determining effect on the number and fecundity of the successive batches and on cumulative fecundity during the season (Morawska, 1984). Water temperature results during spawning period of tench in Seyhan reservoir were different to the results of other studies (Table 3). Perez-Regadera and Gemio (1995) reported that the spawning period in cultural ponds is between May and June for tench and pointed that temperature is between 10 and 16°C in spring, below 10°C in winter, 33°C in summer. Neophitou (1993) reported spawning in spring when water temperatures ranged from 18-20°C. In experiment, designed to determine the effect of temperature on tench reproduction, Horoszewicz *et al.* (1977) found that females

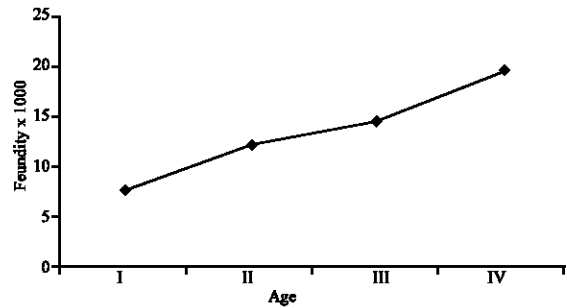


Fig. 3: Relationships between fecundity and age of female tench from Seyhan reservoir

Table 3: Some findings for reproductive biology tench from different regions in Turkey

Spawning period	Temperature (°C)	Maturity age (male/female)	Egg radii (mm)	Fecundity	Study area	References condons
April to July	12.3-25.6	II-III	0.606-1.195	13766-43148	Porsuk dam lake (Kutahya-Turkey)	Yilmaz (2002)
June to July	16.1-19.2	III-IV	0.532-1.078	27460-74042	Kayabođazi dam lake (Kutahya-Turkey)	Alas and Solak (2004)
May to July	12.9-26.3	III-III	0.400-1.300	12088-37150	Hirfanli dam lake (Kirsehir-Turkey)	Benzer <i>et al.</i> (2007a, b)
May to August	23.0-31.6	II-II	0.370-0.870	7800-19560	Seyhan reservoir (Adana-Turkey)	Present study

in a warm pond matured earlier had higher fecundities and spawned more often than tench in a colder pond (Rowe, 2004). The spawning period of tench took place from beginning of May to the end of August in Seyhan Reservoir. Herzig and Winkler (1985) reported that spawning of the tench took place in June and July (Alas and Solak, 2004). Climatically discrepancies have shown different area of Turkey. As shown in Table 3, findings of Yilmaz (2002), Alas and Solak (2004) and Benzer *et al.* (2007a,b) about spawning period for tench populations were different from the study.

CONCLUSION

In this study, tench was able to adapt well in Seyhan reservoir. Because tench showed that was good reproduction ability at this region. In addition, this provides basic information about reproduction and population structure of tench in Seyhan reservoir.

REFERENCES

- Alas, A. and A. Ak, 2007. Investigation of some population of the tench (*Tinca tinca* L., 1758) inhabiting Beysehir Lake (Konya-Turkey). *Turk. J. Vet. Anim. Sci.*, 7: 139-145.
- Alas, A. and K. Solak, 2004. The reproductive biology of the tench (*Tinca tinca* L., 1758) in Kayabogazi (Kutahya, Turkey) Dam Lake. *Turk. J. Vet. Anim. Sci.*, 28: 879-885.
- Alas, A., A. Altindag, M. Yilmaz, A. Kirpik and A. Ak, 2010. Feeding habits of tench (*Tinca tinca* L., 1758) in Beysehir Lake (Turkey). *Turk. J. Fish. Aqua. Sci.*, 10: 187-194.
- Altindag, A., L.S. Shah and S. Yigit, 2002. The growth features of tench (*Tinca tinca* L., 1758) in Bayindir Dam Lake, Ankara, Turkey. *Turk. J. Zool.*, 26: 385-391.
- Altindag, A., S. Ozkurt, S. Yigit and S. Ahiska, 1998. The growth features of tench (*Tinca tinca* L., 1758) in Kesikkopru Dam Lake. *Turk. J. Zool.*, 22: 311-318.
- Atasagun, S. and M. Karabatak, 1995. The food items and seasonal variation in feeding of carp (*Cyprinus carpio* L., 1758) and tench (*Tinca tinca* L., 1758) in Mogan Lake (Ankara). *J. Egirdir Fish. Faculty*, 4: 151-167.
- Balik, I., H. Cubuk, S. Cinar and R. Ozkok, 2009. Population structure, growth, mortality and estimated stock size of the introduced tench, *Tinca tinca* (L.), population in Lake Beysehir, Turkey. *J. Applied Ichthyol.*, 25: 206-210.
- Balik, S., H.M. Sari, M.R. Ustaoglu and A. Ilhan, 2004. The structure, mortality and growth of the tench (*Tinca tinca* L., 1758) in Civril Lake, Denizli, Turkey. *Turk. J. Vet. Anim. Sci.*, 28: 973-979.
- Benzer, S., A. Gul and M. Yilmaz, 2009. The feeding biology of tench (*Tinca tinca* L., 1758) living in Kapulukaya Dam Lake. *J. Gazi Educ. Fac.*, 29: 815-832.
- Benzer, S.S., A. Gul and M. Yilmaz, 2007a. Breeding properties of *Tinca tinca* (L., 1758) living in Hirfanli Dam Lake (Kirsehir, Turkey). *E.U. J. Fish. Aqua. Sci.*, 24: 127-129.
- Benzer, S.S., A. Gul and M. Yilmaz, 2007b. The feeding biology of *Tinca tinca* L., 1758 living in Hirfanli Dam Lake. *Cum Univ. Fen Ed. Fak. Fen Bil. Der.*, 28: 40-50.
- Erguden, S.A. and M.Z.L. Goksu, 2010. Age, growth and sex ratio of tench *Tinca tinca* (L., 1758) in Seyhan Dam Lake, Turkey. *J. Applied Ichthyol.*, 26: 546-549.
- Herzig, A. and H. Winkler, 1985. Der einflub der temperature auf die embryonale entwicklung der Cypriniden, *sterr. Fisheries*, 38: 182-196.
- Horoszewicz, L., 1983. Reproductive rhythm in tench, *Tinca tinca*, in fluctuating temperatures. *Aquaculture*, 32: 79-92.
- Horoszewicz, L., K. Bieniarz and P. Epler, 1977. Development of *Tinca tinca* (L.) in various temperature conditions. *Proceedings of the 20th Congress of the International Limnological Society, 7 August 1977, Copenhagen*.
- Hubenova-Siderova, T., G. Grozev, L. Hadjinikdova and E. Paskaleva, 1995. Tench reproduction and biology in pond culture in Bulgaria. *Polskie Archiwum Hydrobiol.*, 42: 197-206.
- Lagler, K.F., 1966. *Freshwater Fishery Biology*. WMC Brown Company, Dubuque, Iowa, pp: 421.
- Lukowicz, M.V. and C. Proske, 1979. Production and reproduction of tench. *Riv. It. Piscic.-A. XIV-N.4. Ottobre-Novembre-Dicembre*, pp: 109-112.
- Morawska, B., 1984. The effect of water temperature elevation on incipient and cumulative fecundity of batch-spawning tench, *Tinca tinca* (L.). *Aquaculture*, 42: 273-288.

- Neophitou, C., 1993. Some biological data on tench (*Tinca tinca* (L., 1758)), in Lake Pamvolida (Greece). *Acta Hydrobiol.*, 35: 367-379.
- Nikolsky, G.V., 1963. *The Ecology of Fishes*. Academic Press, London, pp: 353.
- O'Maoileidigh, N. and J.J. Bracken, 1989. Biology of the tench, *Tinca tinca* (L.), in Irish Lake. *Aquacult. Fish. Manage.*, 20: 199-209.
- Perez-Regadera, J.J. and R.V. Gemio, 1995. Reproduction of tench *Tinca tinca* (L., 1758) in spawning ponds. *Polskie Arch Hydrobiol.*, 42: 57-61.
- Pimpicka, E., 1991. Fecundity of tench *Tinca tinca* (L.) females in Lake Drweckie. *Acta Ichthyol. Pisci.*, 21: 129-141.
- Rodriguez, R., J.D. Celada, M. Sáez-Royuela, J.M. Carral, A. Aguilera and P.M. Melendre, 2004. Artificial reproduction in 1-year-old tench (*Tinca tinca* L.). *J. Applied Ichthyol.*, 20: 542-544.
- Rowe, D.K., 2004. Potential effect of tench (*Tinca tinca*) in New Zealand freshwater ecosystems. NIWA Client Report, HAM2004-005, Hamilton, New Zealand, pp: 28.
- Vetlugina, T.A., 1992. The biology of tench, *Tinca tinca*, in the Volga Delta. Russia. *J. Ichthyol.*, 32: 58-64.
- Yilmaz, F., 2002. Reproductive biology of the tench *Tinca tinca* (L., 1758) inhabiting Porsuk Dam Lake (Kutahya, Turkey). *Fish. Res.*, 55: 313-317.