



Meat yields of crayfish caught from koçkale hunting area of Keban Dam Lake during reproduction period

Önder AKSU^{1*}, Filiz KUTLUYER¹

¹Munzur University, Fisheries Faculty, 62000, Tunceli.

*Corresponding Author

E-mail: onderaksu23@mail.com

Abstract

This study was carried out to determine the meat yields of crayfish in Keban Dam Lake Koçkale Hunting Site during the breeding period. Crayfish were hunted with pinter nets in May 2019 and brought to the Laboratory of Fisheries Faculty of Munzur University. Crayfish were kept for 24 hours at -20°C for anesthesia. Then, the abdominal meat was extracted and weighed and the meat yield was determined by proportioning it to body weight. Meat yield was 10.028% in male individuals, 13.346% in female individuals and 11.229% in all individuals. A strong linear relationship was between the weights of crayfish and abdominal meat yields ($r^{\delta} = 0.828$, $r^{\text{♀}} = 0.770$, $r^{\delta+\text{♀}} = 0.751$). It was determined that the relationship between abdominal width and meat yield of female and male crayfish were close to each other according to r values ($r^{\delta} = 0.757$, $r^{\text{♀}} = 0.722$). However, it was observed that the linear relationship between the abdominal length of the females and the amount of meat was stronger than the male subjects ($r^{\delta} = 0.524$, $r^{\text{♀}} = 0.736$).

Keywords: Keban Dam Lake, crayfish, meat yield.

INTRODUCTION

Crayfish belonging to the genus *Astacus* spread in many countries in Asia and Europe show [1]. Turkey's only native crayfish species as *Astacus leptodactylus* It is known, however, in recent years a species of central and southeastern European origin the presence of *Austropotamobius torrentium* on Velika and Madara rivers [2-4]. *A. leptodactylus* easily distinguishes from different crayfish species with narrow clamps and is also known as Turkish, Galician, bog or pond crayfish [5]. Crayfish are culturally important in most countries, traditionally important for centuries which are consumed in these days and have high economic value in the market [6]. Crayfish meat has high amounts of Na, K, Ca and Mg elements and vitamin B, vitamin C contains. It contains more carotene than most fish species and a low-calorie protein source [7, 8].

If a crayfish population is to be utilized efficiently, determine the amount of stock population to learn about it alone will not be enough. In addition, determination of the characteristics of the population, effective management plans It is important in the creation stage [9]. For a sustainable

population management it is necessary to determine the methods to be selected correctly. There is no method for a general overview for all conditions. Studies on the genre, characteristics of environmental environment and social features may vary. Therefore, an improvement application ecological, economic and social impacts on population it is necessary to know the features [10-12].

Length measurements of body parts of crayfish is used to determine morphological differences of male and female crayfish between species [13-15]. These measurements comparative growth of populations [16, 17], crayfish to be released to the market size, meat yield and systematic separation is used to determine [18-20].

This study was carried out to determine the meat yields of crayfish in Keban Dam Lake Koçkale Hunting Site during the breeding period.

MATERIAL AND METHODS

The study was performed in the Keban Dam Lake Koçkale hunting area (Figure 1) with samples that were hunted with pinteres during the breeding period.



Şekil 1. Keban Dam Lake Koçkale Hunting Site [21, 22].

The hunted crayfish were kept in crates containing ice and brought to the laboratories of the Fisheries Faculty of Munzur University. The length parameters of the crayfish were measured by Rhodes and Holdich's method [23]. Length measurements were measured with 0.5 mm precision caliper in millimeters. Body weights were weighed with 0.1 g precision and meat amounts were weighed with 0.01 g precision. The crayfish were kept at -20°C for 24 hours and their abdomen was cut with scissors and the weights of the meat extracted from these parts were weighed. Meat yields of crayfish were determined by proportioning the weight of meat extracted from their abdomen to total body weight.

The significance of the difference between the amount of meat of male and female individuals was compared with statistical t-test using SPSS 14 computer software.

RESULTS

In the study, the amount of abdomen meat was 6.66 ± 1.64 g in male crayfish and 5.23 ± 1.39 g in female crayfish. When the abdominal meat amounts of male and female crayfish were examined, the meat amounts of male crayfish were statistically significantly higher than female crayfish ($p < 0.05$).

Although there was a linear relationship between the amount of abdominal meat and carapace length in male and female crayfish, this relationship was stronger in male crayfish ($R^2 = 0.847$) than female crayfish ($R^2 = 0.719$) (Figure 2 and 3).

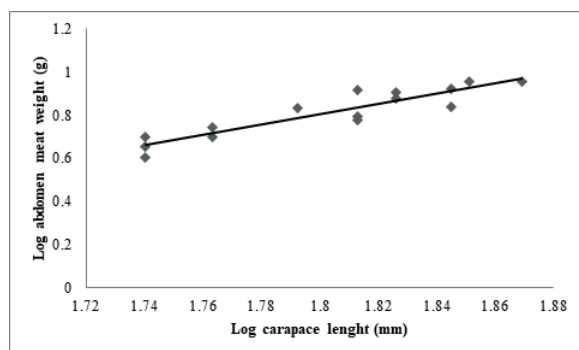


Figure 2. Relationship between meat amounts and length of carapace in male crayfish.

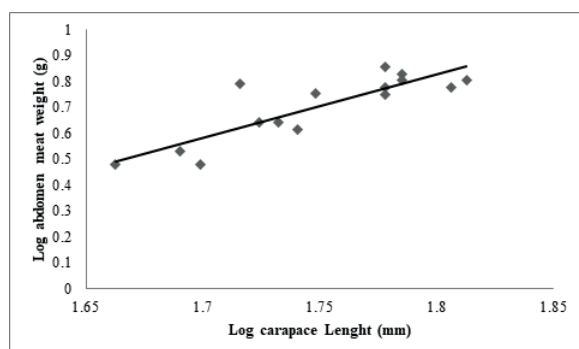


Figure 3. Relationship between meat amounts and length of carapace in female crayfish.

When meat yields were examined, it was determined that abdominal meat yields of male crayfish were 10,028%, abdominal meat yields of female crayfishes were 13,346%, and meat yields of all crayfishes were 11,229%.

DISCUSSION

In a study conducted in Egirdir, Iznik and Hirfanli lakes, the mean amount of abdominal meat was found to be 3.93, 2.99 and 3.46 g in male individuals, and 4.49, 4.08 and 3.53 g in female subjects, respectively [24]. In another study conducted in Lake Gaga, the average meat amount was found to be 5.52 in males and 2.81 g in females [25]. In Aktaş Lake, the meat yield of male individuals was found to be 6.19 g and that of female subjects was 5.45 g [26].

Although the average meat amounts in other studies are considerably lower than the values obtained in this study, it is necessary to look at the meat yield values in order to make a better interpretation of this difference. Meat amounts are an indicator but do not fully reflect meat productivity. Since the size distributions of the hunted individuals will have an effect on the amount of meat, it will be healthier to take meat yield rather than the amount of meat as the basic data. For example, while the amount of meat obtained from Gaga Lake crayfish is smaller than the amount of meat obtained in this study, meat yield rates are larger than the data obtained in this study.

Keban Dam Lake in the first of two different studies conducted in Çemişgezek region [27], mean total meat yield was found to be 15.16% in male individuals and 16.25% in female individuals, while in the second study [28] it was 21.42% in male individuals and 21.02% in female individuals. In the study carried out in Mamasın Dam Lake, it was found that 14.83% of males and 12.76% of females [29].

In the Apolyont Lake study, this rate was 15.86% in males and 17.36% in females [30]. The rates of 19.70% in male crayfish and 15.68% in females were obtained in Gaga Lake [25]. In the study performed in Aktaş Lake, it was determined that abdomen meat yield of male crayfish was 10.03%, cheliped meat yield was 4.60% and total meat yield was 14.63%, female crayfish had 11.59% abdominal meat yields, cheliped meat yield was 2.73% and total meat yield was 14.32% [26].

The findings obtained in this study are similar to those obtained in other studies, except for one study [28]. However, the fact that more or less different values have been obtained may be due to the difference in ecological characteristics of the lake, the depths hunted differently or the hunting being performed at different times. Very different results can be obtained especially in the studies carried out immediately after the reproduction and shell change periods. It was observed that the findings obtained by two different researchers in the Keban Dam Lake Çemişgezek region are quite different from each other.

In crayfish with a length of less than 11 cm in Lake Egirdir 3–5 g. While the amount of meat is above 11 cm, it was the amount of meat reaches 8–12 g weight, thus increasing the amount of meat up to 100%. Cheliped meats of crayfish under 11 cm are not available. Prohibition of hunting crayfish smaller than 11 cm is necessary for further growth of the crayfish population and high meat yield [31].

REFERENCES

- [1] Skurdal, J. ve Taugbøl, T., (2002). Crayfish of commercial importance *Astacus*. in Holdich, D.M., Biology of Freshwater Crayfish, Blackwell Science, 467-510, Oxford,
- [2] Utku, G. ve Harlioğlu, M.M., (2009). Status of freshwater crayfish distribution in Thrace region of Turkey. Reviews in Fisheries Science, 18, 1: 1-6.
- [3] Harlioğlu, M.M. and Güner, U., (2007). A new record of recently discovered crayfish, *Austropotamobius torrentium* (Shrank, 1803), in Turkey. Bulletin Français de la Pêche et de la Pisciculture, 387: 1-5.

[4] Harlioğlu, M.M. and Güner, U., (2006). Studies on the recently discovered crayfish, *Austropotamobius torrentium* (Shrank, 1803), in Turkey: morphological analysis and meat yield. *Aquaculture Research*, 37: 538-542.

[5] Köksal, G., (1988). *Astacus leptodactylus* in Europa. *Freshwater Crayfish, Biology, Management and Exploitation*, in Holdich, D.M. and Lowery, R.S., *Freshwater Crayfish, Biology, Management and Exploitation*, Chapman and Hall, 365-400, Cambridge, England, 498p.

[6] Harlioğlu, M.M. and Holdich, D.M., (2001). Meat yields in the introduced crayfish, *Pacifastacus leniusculus* and *Astacus leptodactylus*, from British waters. *Aquaculture Research*, 32: 411-417.

[7] Goddard, J.S., (1988). Food and Feeding. Holdich, D.M. and Lowery, R.S., *Freshwater Crayfish, Biology, Management and Exploitation*, Chapman and Hall, 145-166, Cambridge, England.

[8] Harlioğlu, M.M. and Köprücü, K., (2000). An investigation on the vitamin A2, C, E and β -carotene contents of freshwater crayfish, *Astacus leptodactylus* Eschscholtz. *Fırat Üniversitesi Fen ve Mühendislik Bilimleri Dergisi*, 12, 2, 277-281.

[9] Bolat, Y., (2001). The Estimation of population size of freshwater crayfish (*Astacus leptodactylus salinus* Nordmann, 1842) in Hoyran Part of Lake Eğirdir. phd thesis, Süleyman Demirel University, Graduate School of Natural and Applied Sciences, Isparta.

[10] Burba, B., (1993). Investigations of the effects of anthropogenic factors on crayfish behavioural reactions. *Freshwater Crayfish*, 9: 259-265,

[11] Lodge, D.M. and Hill, A.M., (1994). Factors governing species composition, population size, and productivity of cool-water crayfishes. *Nordic Journal Freshwater Research*, 69: 111-136.

[12] Harlioğlu, M.M., (2004). Tatlı su istakozu yetiştiriciliği, Fırat Üniversitesi Yayın Komisyonu Başkanlığı, Elazığ.

[13] Mason, J.C., (1975). Crayfish production in a small woodland stream. *Freshwater Crayfish*, 2: 449-479.

[14] Stein, R.A., (1976). Sexual dimorphism in crayfish chelae: functional significance linked to reproductive activities. *Canadian Journal of Zoology*, 54: 220-227.

[15] Adegboye, D., (1983). The "crayfish condition factor": a tool in crayfish research. *Freshwater Crayfish*, 5: 3-11.

[16] Skurdal, J., (1994). Crayfish management in the Nordic and Baltic countries. *Nordic Journal Freshwater Research*, 69: 181-184.

[17] Pursiainen, M., Saarela, M. and Westman, K., (1988). Moulting and growth of the noble crayfish *Astacus astacus* in an oligotrophic lake. *Freshwater Crayfish*, 7: 155-164.

[18] Rhodes, C.P. and Holdich, D.M., (1979). On size and sexual dimorphism in *Austropotamobius pallipes* (Lereboullet) – A step in assessing the commercial exploitation potential of the native British freshwater crayfish. *Aquaculture*, 17: 345-358.

[19] Lindqvist, O.V. and Lahti, E., (1983). On the sexual dimorphism and condition indexes in the crayfish *Astacus astacus* L. in Finland. *Freshwater Crayfish*, 5: 3-11.

[20] Harlioğlu, M.M., (2002). Keban Baraj Gölü Ağın bölgesinde yaşayan tatlı su istakozu *Astacus leptodactylus* (Eschscholtz, 1823)'un alt tür teşhisi. *İstanbul Üniversitesi Su Ürünleri Dergisi*, 14: 31-47.

[21] URL-1, 2017. <http://cografyaharita.com/haritalarim/2eturkiye-akarsular-haritasi.png>. Türkiye Akarsular Haritası. 20 November 2017.

[22] URL-2, 2017. <https://www.google.com.tr/maps/place/%C3%87%C4%B1d%C4%B1r+G>