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Full Length Article

Sex-related Growth Performance of Bleak (*Alburnus alburnus*)

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ABSTRACT

This study is focused on bleak (*Alburnus alburnus* L.) grown naturally in the Enne Dam located within the borders of Kütahya province, in Turkey. In the study the lengths of bleak were measured at 25 different times according to this sex separately, the relationship between this length and time were determined of the male and female growth data were evaluated separately and examined through Von Bertalanffy growth curve model. Coefficient of determination (R^2), mean square error (MSE) and mean relative error (MRE) were used as comparison criteria. This research work revealed that the growth of bleak varied significantly. © 2010 Friends Science Publishers

Key Words: Bleak; Growth performance; Von bertalanfy; Enne dam lake

INTRODUCTION

In order to explain or predict the biological life, it is necessary to identify cause-effect relationships. The main characteristic of biological growth differs from other types of growth as the ability of a part, which forms lately as well as being alive. Growth is one of the most important characteristics of live beings. There had been many definitions of growth but, there is no standard definition of it, growth can be defined as an alteration or a development of a society or an organism identified according to time (Gunel, 1978). Mathematical growth models can determine or predict developments of biological live in different times and circumstances (Yildizbakan *et al.,* 2005).

As for fishes, the growth is the increase of length and weight in course of time. Like other live beings fishes grow both in terms of length and weight. Growing in terms of length is fast in juveniles. However it slows down in later parth of age, while after sometime it stops completely. On the other hand the increase of weight follows a bit different way. Contrary to the increase of length, the increase of weight is a bit slow in first ages and then it gets faster. If the fish gets old, it will increase in length as weight slower again. So it follows a way similar to "S" shape. There are lots of members in the population during the first ages. However as a result of deaths, the more the fishes grow the more old members of population decreases. The growth of fishes depends on the genetic characteristics and the environment in which they live. Since fishes need the nutriment for living, the effect of environment is quite big on growth. As a result of applying the model of growth in fisheries, if growth can be foreseen and future plans for fish health can be made accordingly. Furthermore it helps, while choosing the alternative plans can be made within the ecosystem (Raikova-Petrova *et al*., 2009).

Von Bertalanffy model suggests that the change caused by growth is the reflection of metabolic activities. Therefore it is necessary to identify metabolic activities variable that are species specific to represent these activities numerically. It is possible to identify them in restricted circumstances, but is quite difficult to do so in huge water ecosystems. That is why it is necessary to define fish ecosystems using mathematical methods. The model of Von Bertalanffy is mostly used, while studying on the growth of in natural water bodies.

The studies on lobsters (Annala & Bycroft, 1988) and sharks (Branstetter & Stiles, 1987) can be given as an example for the significance of growth studies. In Karasu River, Askale, 375 silver fish (*Chalcalburnus mosullensis*) their population structure and growth characteristics were examined by Türkmen and Akyurt (2000), between 1 and 2 years, 42.13% compared to 2 years group that were found to be dominant. Froese and Binohlan (2000) also presented an emprical relationship to predict lenght at first maturity in fishes. They explained 89% total variance for data set of 467 populations.

Growth parameters of minus fish (*Leiognathus klunzingeri*) were determined in August 1995, where 724 samples were collected and estimated as described by Özaydın and Leblebici (2008). Constant growth and weight of longitudinal Von Bertalanffy L ∞ = 11:51 cm, K = 0.262 y -1, to = -0.841 y, W ∞ = g was calculated as 21:29.

Length-weight relationship W = 0.0122 * TL was found to be 3.0552.

Central Black Sea Region(Samsun-Inebolu), between October (1995), September (1996), horse mackerel (*Trachurus trachurus* L.) fishery study conducted on 720

fish populations of the age, lenght, weight, sex composition and growth and mortality rates were examined by Yücel and Erkoyun (2000). In the study, length-weight relationship W = 0.00759 $L^{3.05}$, Endurance Factor 0.843 and Von-Bertalanffy growth equations; Lt = 16.92 (1-e-0.3538 (t +2.7938)) Wt = 47.11 (1-e - 0.3538 (t +2.7938)) 3.05 were found between 0-7 age fish groups.

According the Özdemir and Erdem (2006) size and age composition of whiting (*Merlangius merlangus euxinus*) and turbot (*Psetta maxima*) some population parameters were calculated and compared. According to datum coefficient of instant death (Z), live rate (S), actual mortality (A) and natural mortality coefficient (M) For the age composition of turbot 90.57 cm, were 0.1324, 0.4511, 0.6369, 0.3631 and 0.2169, respectively while that of 82.21 cm length were 0.1168, 0.5967, 0.5506, 0.4494 and 0.2053 as a calculating.

Another study on *Neogobius fluviatilis* (monkey goby) (Sasi & Berber, 2010); from Manyas Lake (Balikesir/Turkey) between April 2006-March 2007, 622 specimens of monkey goby and their some biological characteristics values, age and sex parameters were studied. The von Bertalanffy growth equations; Lt= 22.89 and Wt= 99.85, the following equation is for length-weight relationship, W= 0.127 TL, R= 0.8763 were predicted.

MATERIALS AND METHODS

The fish samples were obtained from Enne Dam Lake at monthly intervals during 1998-2000. All fish specimens were caught using gill nets. In the laboratory, the fish lengths were measured (total length) to the nearest 1 mm, weight to the nearest 0.01 g and sex were registered. Study method was used as the Von Bertalanffy growth function. This function is a developed model, especially for the growth of fish in this area, because it is used as intensively.

Von bertalanffy model: Von Bertalanffy function was originally developed in 1934 by Von Bertalanffy and later Beverton and Holt in 1957 by the various changes have been made on this function. Von Bertalanffy function can be written in the following form:

$$L_t = L_\infty (1 - e^{-k(t-t_0)})$$

L_t: Fish length (t) at the time any (meters or cm),

k: Brody growth coefficient ($year^{-1}$),

t: Any time (day, month or year),

t_0: Fish without measuring the length of the previous age (years), a theoretical value,

L_∞: Fish can be reached in case of infinite growth theoretical length value (maximum size, m or cm) are shown.

Comparison criteria of the growth of both fish species as:

Determination coefficient (R^2):

$$R^2 = 1 - \frac{\sum_{i=1}^{n} (Y_i - \hat{Y}_i)^2}{\sum_{i=1}^{n} (Y_i - \bar{Y}_i)^2}$$

Mean Square Error (MSE):

$$MSE = \frac{\sum_{i=1}^{n} (Y_i - \hat{Y}_i)^2}{n}$$

And Mean Relative Error (MRE):

$$MRE = \frac{1}{n}\left[\frac{\sum_{i=1}^{n} |Y_i - \hat{Y}_i|}{(Y_{max} - Y_{min})}\right]$$

Values were used, Coefficient of determination close to 1, the error mean square value and mean relative error close to zero, was evaluated as well. In the opposite case of the model does not identify sufficient growth.

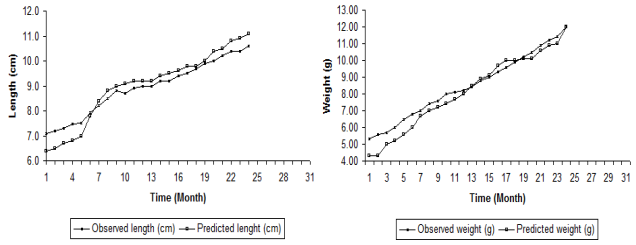
RESULTS AND DISCUSSION

This study revealed that Von Bertalanffy was a successful model for fish growth both in size and weight were estimated. Estimating fish according to the male and female were significantly. Fish length and weight relationship male belonging to their sex distribution of the observed and predicted values are presented in Fig. 1, while those of female weight distribution of the observed and predicted values are shown in Fig. 2.

Identification in terms of fish size (R^2) was 95.2% in males, which slightly increased in females (95.8%). Identification in terms of weight (R^2), while the male 96.0% and females 96.4% this amount increased slightly as has been realized. As with the female in the male for identification values of male were found to be quite high. Weight values were slightly higher than the length defined proportions. Environmental factors that may occur in different growth periods have significant condition effects on fish. However growth values differ with age (Yazgan, 1991). Karataş and Can (2005) observed that different environment and are be effective, to fish growth. During present investigation of locations in the region, the effects on fish growth enhanced. Raikova-Petrova *et al.* (2009) reported that the reproductive condition for bleak. In relation to season of growth Keckeis and Schiemer (1990) observed nutritional effects on the growth of bleak the respiratory condition positive effects on growth also.

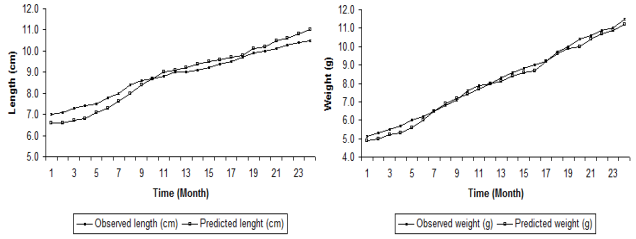
When the mean square error values were examined, the observed values of fish weight and length belonging to the female were lower than the values of male. The average

Fig. 1a: Male belonging to the expected growth *A. alburnus* size and estimated values [L_t = 18.23 {1-e-0.2158 (t +1.51)}] and (b) expected increase in weight of males belonging to *A. alburnus* and estimated values [L_t = 19.48 {1-e-0.2008 (t +1.91)}]



a b

Fig. 2: Expected growth of female owned *A. alburnus* size and estimated values [Wt = 21.04 {1-e-0.2043 (t +1.88)}] (a) and expected increase in weight of females belonging to *A. alburnus* and predicted values [Wt = 23.52 {1-e-0.2132 (t +1.85)}] (b)



a **b**

lenght for male in terms of mean squares error was 4.341, while that female specimens low. However the difference was quite small. The average values in terms of weight for male mean squares error was 3.234, while female had 2.691.

As with the female in the male average for mean squares error was found to be close to each other. Values weight were proportional to mean square error that was slightly lower than the values weight of female of thought and Mean Relative Error values were examined again that showed similar results were obtained as mean square errors. The average Relative Error 0.024 in terms of length, while males, while that of females was slightly lower. The average values for male in terms of weight relative error 0.011, while this figure in 0.009 for female.

CONCLUSION

Growth and increase in size and weight of bleak over 90% rise in the coefficients of determination, mean square error and relative error values were correspondingly low rise showing the success of the model in the description.

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