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Growth parameter, Length-Weight relationship and quality coefficient of klunzingeri Mullet (*Liza klunzingeri*(Day, 1888)) in the Coastal of Khuzestan (Northwest of Persian Gulf)

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ABSTRACT: Biological characters of Liza klunzingeri, in two areas (Sajaphi and Bhrekan) in the coastal waters of Khuzestan were investigated. From March to February 2009, a total 1880 measured fish specimens, 947 specimens were analyzed. The growth indices for males and females studied fishes were found to be L∞=20, 24(cm), K=0.83, 1.2 (year^{-1}) and to=-0.15, -0.21 respectively. The length-weight relation were calculated as $Y=0.024L^{2.76}$ (n=336, R2=0.72) for males, $Y=0.011L^{3.00}$ (n=596, R2= 0.78) for females and $Y=0.0208L^{2.82}$ (n=936,R^2 =0.82) for both sexes. Mean length for the male and female were calculated as 17/97±1/15, 19/11±1/49 and mean weight for the male and female was as73/43±13/71, 85/91±20/95 respectively. The mean Values of condition factor (K) was 1/25± 0/14 in male specimens and 1/21± 0/15 for female specimens. The highest K value in June and the lowest in Febre were observed. According to biological characteristics and with compare to American fisheries society (AFS) indices, *Liza klunzingeri* is classified as low vulnerable group fishes.

***Keywords*:** Liza klunzingeri **,** growth parameters, Coastal Khuzestan.

INTRODUCTION

The family Mugilidae plays an important role in commercial fisheries and aquaculture worldwide.Liza klunzingeri (Day 1888), formerly known as *L. carinata* (Carpenter *et al*., 1997), is one of the valuable fish with high catches in Khuzestan province coastal waters(Hendijan- Bahrakan). It is found in Indian Ocean from the Red Sea to Bombay and also been reported from coast of Japan and China (Fisher and Bianchi, 1984). The abundance of grey mullets in estuarine and coastal areas of all tropical and subtropical regions may be related to their food and feeding habits, as they occupy a relatively low position in the food web (Wright, 1988). It's mostly caught by purse seine and trammels net.

Despite its worldwide commercial importance, only very limited and disparate information exists on any aspect of the biology of the Mugilidae species in the Coastal of Khuzestan(Javadzade,1994) and Kuwait waters (Abou-Seedo and Al-Khatib, 1995; Abou-Seedo *et al*., 2002). We need to provide much-needed scientific data for the management and rational exploitation of this valuable resource, that the present study was undertaken to evaluate the growth characteristics, length-weight relationship and fish condition factor of this species in the Coastal of Khuzestan.

MATERIALS AND METHODS

Sampling was done in Serimeh station and Bahrekan by using purse seine and trammel net (Fig 1).It was randomly done biweekly. Fishes were measured in landing and samples were transferred to the lab for detailed

examination. Growth was investigated by fitting the von Bertalanffy growth function to length frequency data. The von Bertalanffy growth equation is defined as follows (King, 2007): Lt=L∞ [(1-exp (-K (t-t0))]

Where Lt is length at time t, L∞ = the asymptotic length, K=the growth coefficient and t_0 is the hypothetical time at which length is equal to zero. The Response Surface Analysis from the FISAT program provided estimates of L∞ and K.

t_0 was estimated by using the equation of Pauly (1980):

Log (-t0) = -0.3922 - 0.2752 Log L∞ - 1.038 Log K .

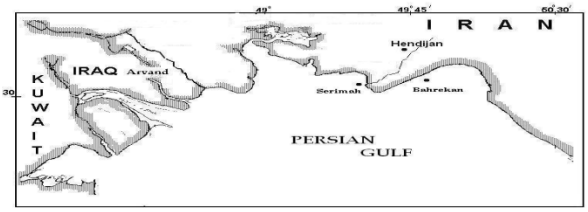

Figure 1. sampling sites in Khuzestan coastal waters

The length - weight relationship was measured by using

$W=a \times L^b$) ((W= weight (g), L= length (cm),a and b = regression variables (Biswass,1993).

The equation $K=W\times10^2 /L^3$ was used to find fish status changes (condition factor) in which w= weight and L = total length(Beckman,1984).L∞ was calculated by Powell wetheral plot $L^{-} - L' = a+b L'$ (L∞= a/b) and equation growth coefficient was estimated using ELEFAN method in FISAT software (Gayanilo *et al*., 2003).

FISAT and Excel software were used for analyzing data.

RESULTS AND DISCUSSION

Total of 1880 fishes were examined throughout the year study (excluding March because of lack of samples). Sex determination and maturity stages of 947 fishes (336 male,596 female and 15 immature) were determined.

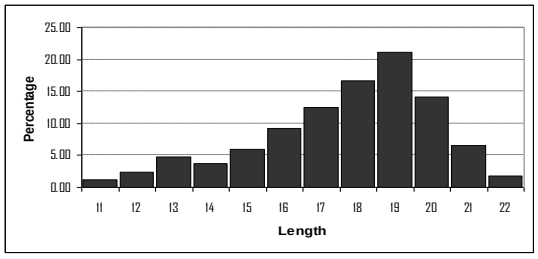

Figure 2. length frequency distribution of L.klunzingeri in Khuzestan coastal waters (2009)

The total length ranges and the mean length for male and female were 12-13(17/97±1/15) cm and 23-13(19/11±1/49) cm respectively. The total weight ranges and mean weight for the male and female were 28-109 (73/43±13/71)g and 25-157 (85/91±20/95) g respectively (table 1).

Table 1. mean length, mean weight and condition factor value of L.klunzigeri in Khuzestan waters (2009)

Month	k (male)	k (female)	W (male)	W (female)	L (male)	L (female)
May	1/29±0/16	1/35±0/15	8.27±71.8	13.46±69.66	1.11±17.66	1.40±17.25
June	1/36±0/1	1/36±0/13	10.75±79.96	20.73±105.36	0.8±18.03	1.27±19.72
July	1/24±0/12	1/25±0/10	11.63±71.41	13.91±89.27	1. 1±17.91	0.99±19.21
August	1/30±0/11	1/29±0/10	10.37±70.08	18.60±99.53	0.89±17.25	1.36±19.70
September	1/27±0/11	1/33±0/10	9.78±74.66	17.21±93.22	1.12±18.04	1.07±19.11
October	1/28±0/11	1/30±0/11	10.37±80.58	18.07±97.34	0.72±18.45	1.10±19.53
November	1/25±0/09	1/25±0/10	10.47±78.3	12.44±92.94	0.85±18.4	0.81±19.49
December	1/20±0/12	1/16±0/09	17.65±69.28	14.31±87.20	1.99±17.85	1.17±19.51
January	1/21±0/14	1/08±0/11	2.30±54	18.09±73.31	0.57±16.5	1.76±18.81
February	1/13±0/14	1/05±0/11	4.96±71	17.09±62.91	0.57±18.5	1.73±18.04
March	0/98±0/09	0/97±0/08	14.19±49.31	19.77±59.93	1.82±17	2.11±18.13
Mean	1/25±0/14	1/21±0/15	13.71±73.43	20.95±85.91	1.15±17.97	1.49±19.11

The growth parameters for males and females fishes were found to be L∞=20 and 24(cm), K=0.83and 1.2 (year-1) and t0=-0.15 and -0.21 respectively (Fig3, 4)

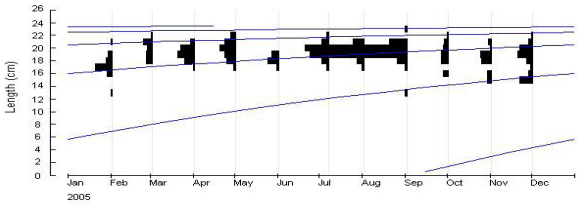

Figure 3. female growth curve of L. klunzingeri in Khuzestan coastal water (2009)

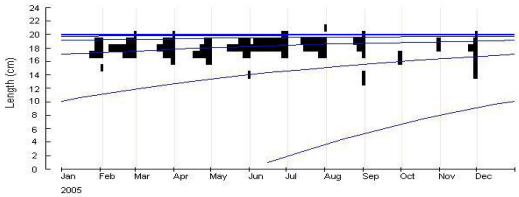

Figure 4. male growth curve of L. klunzingeri in Khuzestan coastal water (2009)

The length-weight relation were calculated as Y=0.024L2.76 (n=336,R2=0.72) for males, Y=0.011L3.00 (n=596,R2= 0.78) for females and Y=0.0208L2.82 (n=936,R2 =0.82) for total fishes(fig5,6).

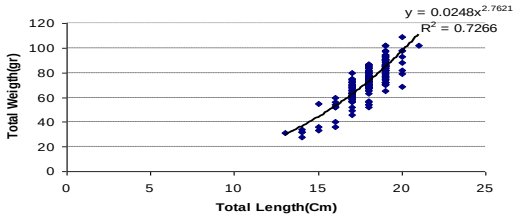

Figure 5. male length – weight relationship in Khuzestan coastal waters (2006)

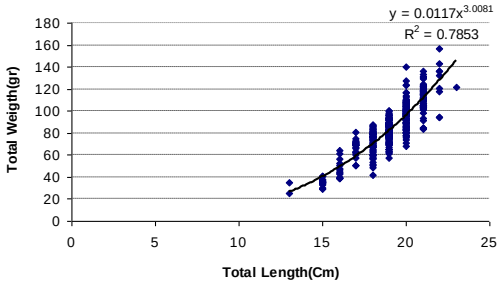

Figure 6. female length – weight relationship in Khuzestan coastal waters (2009)

The mean Values of condition factor (K) were 1/25± 0/14 in male fishes and 1/21± 0/15 for female. The highest K value in June and the lowest in February were observed (table 1).

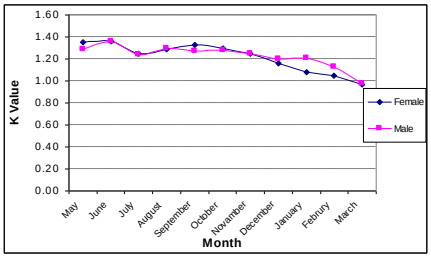

Figure 7. condition factor (k) of L. klunzingeri in Khuzestan coastal waters

CONCULSION

Maximum length in this study was found to be 23 cm. In the previous studies this length, 20 and 30cm has been reported in Persian Gulf (Carpenter *et al*., 1997 ;Golani, 2002).The maximum and minimum length respectively were found 19.5 and 18.5cm for male and 22.5 and 15.90 for female in Khuzestan coastal waters (Javadzadeh, 2004). The maximum and minimum weight respectively were found 90.8 and 43.8 g for male was and 154 and 45.6 g for female and b=2.8, a=0.00003 were calculated for total studied fishes (Javadzadeh, 2004).
The morphological and reproductive characteristics, population sizes and genetic frequencies of species are adjusted to their environments by natural selection and species inhabiting different environments show different patterns of life history characteristics (Adams,1980).

The highest amount of (k) was observed in spring after a full feeding season and decreased after spawning time in winter which shows the affect of ovary weight on fatness. K was the same for both sexes but after spawning time it decreased in female due to use of most energy in spawning time. According to Zavadzadeh(2004) results K was high in Spring and earlier Summer and very low in the end of summer .

Condition factor is a well-being value and it increasing coincide with fish weight increasing (King,2007). Seasonal growth amount can be measured by status factor and growth changes may be related to fish food or reproduction stage (King,2007).

Length- weight relationship of this fish was indicated allmotric growth ($P<0.05$), with b= 2.82, in which by increasing length, the weight increases too and female were bigger than male.
It is affected by some factors such as seasonal changes in environmental parameters, sex maturation and even day time (Baganl, 1978 ;Biswass,1993). While an animal grows with a fixed ratio It is called isometric growth and when (b=3) it shows an isometric growth (King,2007).

Marthin (1994) believed "b range is from 2.5 to 4" and tesch (1968) believed "b=3 in fish with isometric growth". In length- weight a value is related to fish condition. Also (a) depends on weight and it can be used as status value (King, 2007). In present study (a) was 0.0208 .According to vanbertalenfi equation growth equation for male: L_t=20 (1-ep (t+0.15 and for female: L_t= 24 (1-exp (0.83 (t+0.21) were estimated, in which L= length (cm), t= fish age (year) (Fig 8).

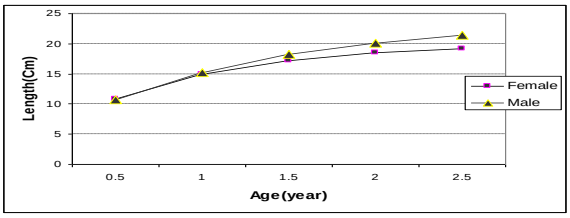

Figure 8.: male and female growth of L.klunzingeri in Khuzestan coastal waters

Regarding to Tmax= 3/k maximum age for male and female was found to be 2.5 and 3.61 year respectively. Results indicated age and growth conditions have opposite relations, so in males which have higher growth condition they have short life and visa versa in female.

Absorbed energy is used for body maintenance, activity, reproduction and less than $^{1}/_{3}$ for growth (King, 2007).In different species growth ratio and life cycle is different and low growth ratio decreases required energy and life cycle expansion causes spawning repetition (King, 2007).

Vanberthalenfi formula is common to be use for growth condition. An animal may not grow according to above formula specially before maturation stage, so growth is started from below the zero which is shown by (t_o) or negative amount (King,2007) growth in different aquatics may depend on environment (Biswass,1993)

Table 2. marine Vulnerability classification regarding biological parameter

Biological Paramter	very high Vulnrability	high Vulnrability	mediate Vulnrability	low Vulnrability
maximum length (Lmax)	150< Lmax	100 < Lmax ≤ 150	50 < Lmax ≤ 100	Lmax ≤ 50
mature age (tm)	6 < tmax	*4* <t max ≤6	*≤4*t max*2*<	tmax ≤ 2
Crvture (K) Parameter	*K* ≤ 0/2	0/5 ≤ *K* ≤ 0/2	0/5 < K ≤ *0/8*	0/8 < K
Nature Mortalit (M)	M ≤ 0/2	0/2 < M ≤ 0/35	0/35 < M ≤ 0/5	0/5 < M
maximum age (Tmax)	30 < Tmax	10 < Tmax ≤ *30*	3 < Tmax ≤ 10	*Tmax ≤ 3*

There are different criteria for fish damages classification based on biological & ecological conditions such as (AFS American fisheries Society) which is shown in Fig (2) (Chenung *etal*,2005).

According to biological characteristics and with compare to American Fisheries Society (AFS) indices, *Liza klunzingeri* is classified as low vulnerable group fishes.

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