

Age and Growth of Common Carp (*Cyprinus carpio* Linnaeus, 1758) in Southern Caspian Sea, Iran

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Abstract: In the present study, age, growth and length-weight relationship were investigated in 604 specimens of common carp (*Cyprinus carpio* L. 1758) collected from Southern Caspian Sea, Iran from January to March 2011. Age was determined using scale reading. The age, Fork length and weight of samples ranged from 1 to 8 years, 23 to 50.35 cm and 245 to 2384.28g, respectively. The 4 year age group was the most frequent (44.2%) and the 1 year age groups were the least frequent classes (0.49%). The mean condition factor was 1.83 ± 0.09 (\pm SE). An isometric power length-weight relationship for average total species is determined ($W = 0.025 FL^{2.901}$ ($r^2 = 0.926$)).

Key words: Age • Growth • *Cyprinus carpio* • Caspian Sea

INTRODUCTION

Common carp (*Cyprinus carpio* L) is among the most important freshwater fishes which are distributed all over the world. It is found in brackish water of Caspian Sea as a commercially important fish which is caught by the fisherman in north of Iran. Common carp of Caspian Sea is an anadromic form of Common carp that spawn in the rivers of Iran and some other countries surrounding the Caspian Sea. Fingerlings of Common carp migrate to rivers and it prefers water bodies with stagnant and slowly flowing waters with sand and/or silt bottoms with shell incorporations [1]. Common carp are frequently cultured and are of great commercial value as a fish for food, both over their native and introduced range [2]. Nowadays, world-wide production of common carp is 3.2 million tons which is more than twice the Salmonids production [3].

The determination of fish age and growth is fundamental in fisheries biology and management. Such age determined parameters as mortality and growth underlie the population dynamic models used in fishery analysis. Age studies can furnish other basic data such as stock age structure, age at first

maturity, spawning frequency, individual and stock responses to changes in the habitat, recruitment success, etc [4].

The present study aims to determine the age, growth, relationship length- weight, growth pattern (t) and condition factor of *Cyprinus carpio* in Southern Caspian Sea of Iran.

MATERIALS AND METHODS

604 specimens were collected from January to March 2011 in the southern parts of the Iranian waters of the Caspian Sea (Figure 1). *Cyprinus carpio* were collected using seine nets (with a mesh size length between 40 and 70 mm).

Total length of captured fish was measured to the nearest 0.01 cm and weighted to the nearest 0.01 g [5].

Age was determined using scale reading [6]. Scales were taken from the middle of the body, behind the pectoral fins and above the lateral line. They were then placed in labeled envelopes and returned to the laboratories for reading and analysis. The scales were washed and placed in small covered Petri dishes with tap water. Then, the organic layers of scales were removed by rubbing and washing in tap water [7].



Fig. 1: Map of the Iranian waters of the Caspian Sea, showing the fishing area

The relationship between length and weight was calculated using the exponential regression: $W = a \times L^b$ [8], where W is the total weight (g), L is the Total length (cm), a is the regression constant (intercept) and b is the regression coefficient (slope) that it is usually between 2 and 4. The Fulton condition factor (CF) was determined for each fish using the following equation: $CF = (W/L^3) \times 100$ [5], where W is the total fish weight (g), L is the total length (cm).

The growth pattern (t) was using the following equation: [9].

$$t = \frac{sd \ln L}{sd \ln W} * \frac{|b-3|}{\sqrt{1-r^2}} * \sqrt{n-2}$$

Where Sd Lnx is standard deviation of the length natural logarithm (cm), Sd LnW is standard deviation of the natural logarithm weight (g), b is Curve slope of the relationship between length and weight, R² is regression coefficient between length and weight and n is number of samples.

Tables and graphs were drew by Excel software.

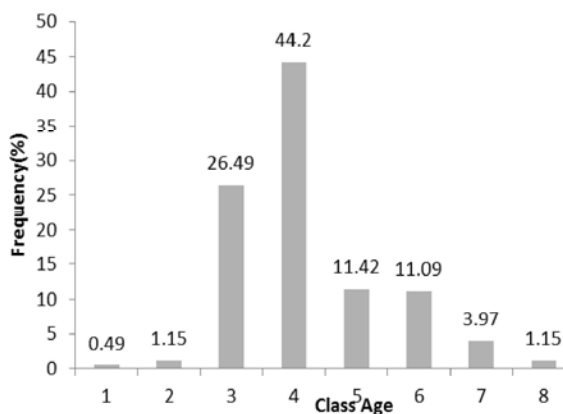


Fig. 2: Age class frequency in *Cyprinus carpio* in Southern part of Caspian Sea

RESULTS

The ages, lengths and weights of the samples ranged between 1-8 years, 23 to 50.35 cm and 245 to 2384.28g. The mean condition factor was calculated as 1.83 ± 0.09 . The mean lengths, weights and condition factors of different ages are given in Table 1.

Table 1: Mean length (L), weight (W), Frequency (%) and condition factor (CF) of Common carp samples by age groups [\pm Standard Error (Min-Max)]

Age groups									
Age groups	1	2	3	4	5	6	7	8	
TF(cm)	23 \pm 3.60	24.57 \pm 2.9	32.43 \pm 2.83	36.38 \pm 1.80	39.71 \pm 2.93	43.08 \pm 2.53	48.87 \pm 2.71	50.35 \pm 1.405	
W(g)	245 \pm 105	276.42 \pm 90.7	630.93 \pm 152.3	875.36 \pm 586.9	1091.66 \pm 259.42	1418.43 \pm 258.97	2023 \pm 405.44	2384.28 \pm 231.34	
F (%)	0.49	1.15	26.49	44.2	11.42	11.09	3.97	1.15	
CF	2.01	1.86	1.84	1.81	1.74	1.77	1.73	1.86	

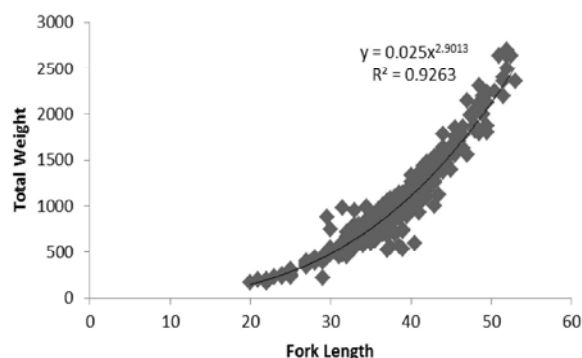


Fig. 3: Length-weight relationship in *Cyprinus carpio* from Southern Caspian Sea to Iran

DISCUSSION

In a fish population, if the age composition has a wide range, it indicates that this habitat has a sufficient food supply [10]. The age, length and weight distributions of the carp captured with experimental nets in the Southern Caspian Sea ranged between 1-8 years, 23 to 50.35 cm and 245 to 2384.28g, respectively. However, the smallest carp caught in commercial fishing was 25 cm in fork length [11]. Probably, small individuals caught in the nets were released into the sea by fishermen because small carp are not popular among consumers. Also weight distributions of the carp by Ghelichi *et al.* [11] ranged between 265-3090g, however, it was higher than this study. These differences may be due to net selectivity, fish activity, fishing pressure, feeding habits and the ecological characteristics of the seas.

The length-weight relationship of the carp population in the Southern Caspian Sea was $W=0.025*L^{2.901}$. The slope value of the length weight relationship showed that body weight increased isometrically with fork length. However, different results were also reported by Ghelichi *et al.* [11]. These variations could be attributed to differences in age maturity and sex. Geographic location and associated environmental conditions, such as seasonality stomach fullness, disease and parasite loads, can also affect the value of Bagenal and Tesch, [5], but similar results were reported by Erdem [12] and Ikiz [13].

In conclusion it is found that the population of *Cyprinus carpio* reflects the expected and previously observed features of age distribution, growing and condition factor in natural fish populations. Proper fishing techniques and following the fishing restrictions are necessary for the continuation of *Cyprinus carpio* population in the Southern Caspian Sea as an economical resource. Fishing of samples with small size and lower

weight will be a threat for *Cyprinus carpio* population in the Southern Caspian Sea.

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