

Biometric characteristic of the *common goldfish* *Carassius auratus auratus* (Linnaeus, 1758) in Basra freshwater systems

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Abstract - About 110 specimens of the goldfish *Carassius auratus auratus* (Linnaeus, 1758) were obtained from the Department of Fisheries and Marine Resources Laboratory College of Agriculture and the Marine Sciences Center, University of Basrah. Morphometric and meristics characteristics were measured, total and standard length ranged between 90-150 mm and between 70-110 mm, respectively. Number of scales in the lateral line ranged from 25 to 27. Number of dorsal branched rays ranged from 14 to 15, gill rakers from 42 to 44. Total vertebrae fin count was 25-27. There were five rays with the branchiostegal rays.

Keywords: Biometric characteristic, goldfish, Basrah.

Introduction

Fish of the genus *Carassius* (Cypriniformes, Cyprinidae), including goldfish, Crucian carp, and Japanese Crucian carp, primarily inhabit freshwater (Takada *et al.*, 2010), Gold fishes comprise 2-3 species found in Europe, northern Asia and the Far East (Coad, 2010).

The gold fish *C. auratus* (Linnaeus, 1758), a cyprinid native to Eastern Asia is one of the earliest fish to be domesticated, and is one of the most commonly kept aquarium fish (Lelek 1987; Rylková *et al.*, 2010), Goldfish is an example of a non-indigenous fish that has been successfully established throughout Europe (Kottelat and Freyhof, 2007; Vetešník *et al.*, 2007), North America (Jenkins and Burkhead, 1993; Nico and Schofield, 2006), South America (Gomez *et al.*, 1997), New Zealand and Australia (Lorenzoni *et al.*, 2007).

Goldfish is one of the most of the popular ornamental species in the world due to its diverse appearance, such as size, body shape, fin characteristics and color (Zhou *et al.*, 2001; Moreira *et al.*, 2011).

Goldfish are resistant to environmental perturbations and anthropogenic disturbances. They tolerate wide temperature ranges high water turbidities, and low oxygen (Szczerbowski, 2002; Balon, 2004). Goldfish are also prolific and mature early (Lorenzoni *et al.*, 2010).

Goldfish have been extensively studies, including works with genetic markers of goldfish hybrids in new Zealand (Smith and McVeagh, 2005). Vetešník *et al.* (2007) examined goldfish morphology and genetic characteristics to distinguish between two forms of *C. auratus* from an artificial wetland in Morava river, Czech Republic. Similarly Papoušek *et al.* (2008) assessed morphometric and genetic variation of two species of genus *Carassius* in the lower Dyic river, Czech Republic. Masson *et al.* (2011) studied the characteristics of head bones. Other studies on goldfish include biological (Lorenzoni *et al.*, 2007; Lorenzoni *et al.*, 2010), hydrological

(Latha and Lipton, 2007), physiological (Luz *et al.*, 2008) and pathological investigations (Osman *et al.*, 2009; Bergmann *et al.*, 2010).

In Iraqi freshwater, there are limited studies of the species *C. auratus*, Jassim (2012) investigated the seasonal changes in the maturity stage of the female and hermaphrodite gonad of goldfish. Moreover, studies determining some morphological criteria of crussian carp *C. auratus gibelio* communities and goldfish in three water bodies in Basrah province have been conducted (Ali, 2008), Al-Noor (2010) has also conducted a study assessing the population status of goldfish in the restored east Hammar marsh, southern Iraq.

The objective of the present study is to assess the morphology and taxonomy of the Basrah goldfish as it is the most widespread species in ornamental fish ponds for culture and hybridization in the region and beyond.

Materials and Methods

A total of 110 specimen was captured during the study period between April 2012 and April 2013. Collections were conducted by the Department of Fisheries and Marine Resources Laboratory and the Marine Sciences Center, University of Basrah. Biometric measurement were performed on all fish collected. Fifteen morphometric and 10 meristic characteristics were taken.

The analyzed meristic characteristic are: scales of lateral line, gill rakers, vertebrae, fin rays, branchiostegal rays. Total and standard lengths of fish were taken to the nearest 0.01 mm. All other lengths were taken using a digital Vernier, Fin rays were counted using a dissecting microscope. vertebrae were counted after removed of the skin and muscles.

Measurements of the body were expressed as of the standard length. Data were statistically analyzed using SPSS program (Version 11.0).

Results

Goldfish were mostly short, deep, with a thickened body, had a gold coloration, and a wide short head with a terminal mouth. The body of sampled fish was covered by large cycloid scales, with a tapered body from the ant region to the tip of the caudal fin, the caudal fin was forked. The fins were mostly firm and the edge of the dorsal fin slightly concave. The caudal peduncle was thick and short, without any spines (Fig. 1).

Total length (TL) ranged from 90 to 150 mm, and the standard length (SL) from 50 to 110 mm (Table 1). The dorsal fin of the sampled fish had 1 unbranched and 14-15 branched rays. Pelvic fin had 1 unbranched and 7-8 branched rays. Pectoral fin had 1 unbranched and 7-8 branched rays, reaching backwards to the base of the pelvic fin. The lower lobe of the caudal fin was slightly longer than the upper lobe. The base of the anal fin reached posteriorly beyond the base of the dorsal fin. The anal fin did not reach the caudal fin.

Breeding tubercles under eye and on opercle, along dorsal surface of the first pectoral fin ray and on the median branched pelvic fin rays at about 60 % of their length. The number, size and pattern of tubercles on the left and right sides differed. The first gill arch had 42-44 gill rakers. The total number of vertebrae was 25-27 (Table 2).

The head of the fish is without scales, broadly triangular, with a broad interorbital space, a snout longer than the eye diameter, and an overreaching maxillary. The lateral line was complete. The dorsal and anal fins were serrated.

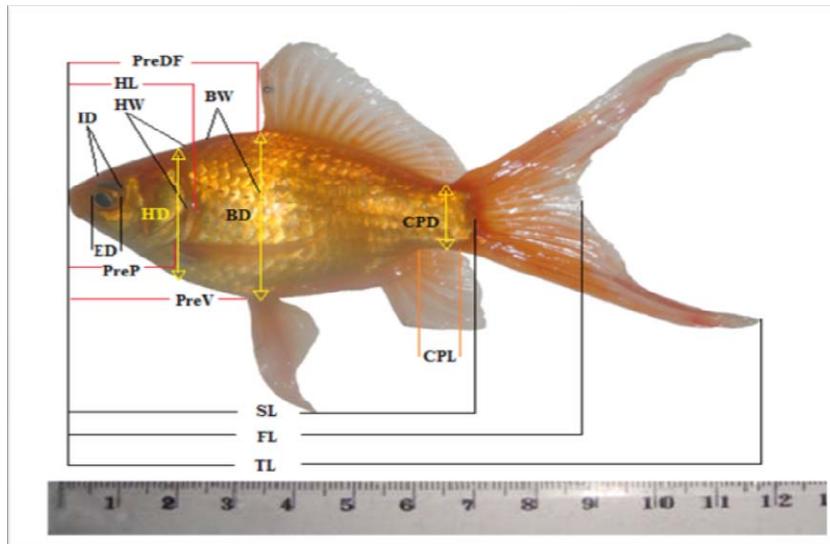


Figure 1. Morphometric measurements of *C. auratus auratus*.

Total length (TL), Standard length (SL), Fork length (FL), Body width (BW), Body depth (BD), Head length (HL), Head depth (HD), Head width (HW), Eye orbital diameter (ED), Interorbital distance (ID), Predorsal fin length (PreD), Prepectoral fin length (PreP), Prepelvic fin length (PreV), Caudal peduncle length (CPL), caudal peduncle depth (CPD).

Table 1. Morphometric measurements of *Carassius auratus auratus* from Basrah.

Morphometric Characteristics	Range	Mean	±SD
Total length (TL) mm	90-150	110.5	27.3
Standard length (SL) mm	50-110	70.3	15.4
Fork length (FL) in /SL mm	1.12-1.22	1.23	2.05
Body width (BW) in /SL mm	33.8-39.3	35.7	0.8
Body depth (BD) in /SL mm	34.3-40.1	38.9	2.0
Head length (HL) in /SL mm	26.5-28.1	27.3	0.6
Head depth (HD) in /SL mm	21.2-22.1	21.8	0.8
Head width (HW) in /SL mm	20.3-21.7	2.6	1.8
Eye orbital diameter (ED) in /SL mm	6.1-7.2	6.8	0.5
Interorbital distance (ID) in /SL mm	9.1-10.2	9.6	0.6
Predorsal fin length (PreD) in /SL mm	45.7-49.1	47.3	1.6
Prepectoral fin length (PreP) in /SL mm	23.6-26.3	24.2	2.1
Prepelvic fin length (PreV) in /SL mm	47-53.1	48.9	1.6
Caudal peduncle length (CPL) in /SL mm	16.8-17.5	16.9	1.5
caudal peduncle depth (CPD) in /SL mm	15.2-16.3	15.8	0.6

Table 2. Meristic counts of *Carassius auratus auratus* from Basrah

Meristic characters	Range (mm)	Mean±SD
Scale of lateral line	25-27	25.80 ± 1.17
Gill rakers	42-44	42.35 ± 1.07
Vertebras	25-27	26.33 ± 0.56
Dorsal fin unbranched rays	1-1	1.00 ± 0.00
Dorsal fin branched rays	14-15	14.73 ± 1.08
Pectoral fin unbranched rays	1-1	1.00 ± 0.00
Pectoral fin branched rays	7-8	7.40 ± 0.30
Pelvic fin unbranched rays	1-1	1.00 ± 0.00
Pelvic fin branched rays	7-8	7.22 ± 0.32
Branchiostegal rays	5-5	5.00 ± 0.00

Discussion

The external morphology and especially the body shape of the fish, has been thoroughly studied by many researchers for many fish species (Sfakianakis *et al.*, 2011). Metric and meristic characters are important to identify fish species and their habitat adaptations (Karaman, 1971; Geldiay and Balike, 1998; Karatas, 2005; Solak, 2009).

A variety of morphological, physiological, behavioral and biochemical characteristics are used in the identification of fishes. In practice though it is more convenient to use morphometric measurements and meristics, these morphometric measurements are usually presented as a proportion of standard, fork and total length (Solak, 2009).

The present study showed that the morphometric and meristic characteristics of the fish match with *C. auratus auratus*. Also, ranges for the number of scales of lateral line, the number of gill rakers, the number of unbranched rays of the dorsal fin and the number of pelvic fins agreed with data reported by Hubbs *et al.* (1991), Rose (2001) and Froese and Pauly (2011). But were different from data by Szczerbowski (2003) and Ali (2008) who reported the number of the scales of the lateral line to be 21-36.

The differences might be due to sampling error and differing habitat characteristics (Nicolosky, 1963). The definition of the species for our target fish is controversial (Kalous *et al.*, 2012), in part due to the high morphological similarity of specimens from the of the genus *Carassius* (Hensel, 1971; Lusk and Baruš, 1978; Vasileva, 1990; Vasileva and Vasilev, 2000). Szczerbowski (2003), however, mentioned that the golden skin coloration and the absence of barbs on the head could be used to identify the present specimens as *Carassius auratus auratus*.

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الخصائص الحياتية للسمة الذهبية
Carassius auratus auratus (Linneas, 1758)
بأنظمة المياه العذبة في البصرة

فوزية شاكر حبيب

مركز علوم البحار، جامعة البصرة، البصرة، العراق

المستخلص - جمعت 110 نموذج من السمكة الذهبية من مختبرات قسم الأسماك والثروة السمكية ومن أحواض أسماك الزينة في محطة الاستزراع في مركز علوم البحار. أخذت القياسات المظهرية والعديدية إلى أقرب ملم، إذ تراوح الطول الكلي بين 90-150 سم والطول القياسي بين 70-110 سم وتراوح عدد الحراشف على الخط الجانبي بين 25-27. تراوحت عدد الأشعة المتفرعة للزعنفة الظهرية بين 14-15 كما تراوح عدد الأسنان الغلصمية بين 42-44 والعدد الكلي للفقرات بين 25-27 وعدد الأشعة العظمية الغلصمية خمسة أشعة.