BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

UO`K: 597:639.3(575.1)

COMPARATIVE ASSESSMENT OF MORPHOMETRIC CHARACTERISTICS, LENGTH–WEIGHT RELATIONSHIP, AND GROWTH PARAMETERS OF COMMON CARP (*CYPRINUS CARPIO* L., 1758) CULTURED IN FISH FARMS OF THE TASHKENT REGION

Rakhmatova Gulnoza Turakhulovna, assistant
e-mail: b900076558@gmail.com
ORCID 0009-0006-1911-398x
Doi: https://doi.org/10.5281/zenodo.21470768

Abstract: This study evaluated the morphometric characteristics and growth patterns of common carp (*Cyprinus carpio* L., 1758) reared in three fish farms of the Tashkent region. Statistical analyses were conducted to determine the relationships among total length, standard length, and body weight. The findings revealed differences in growth performance and morphometric traits among the farms. The results provide a scientific basis for broodstock selection and improving the efficiency of pond aquaculture under regional farming conditions.

Keywords: common carp, *Cyprinus carpio*, morphometry, length–weight relationship, allometric growth, pond aquaculture, Tashkent region.

Introduction: The growing demand for high-quality protein, the decline of fish stocks in natural water bodies, and the continuously increasing need for aquaculture products have made the scientifically based development of the fisheries sector one of the most pressing priorities. In recent years, pond aquaculture has expanded rapidly worldwide as a highly productive, environmentally sustainable, and economically efficient method of food production. In particular, the intensive culture of cyprinid fish plays a significant role in ensuring food security.Common carp (*Cyprinus carpio* L., 1758) is one of the most widely cultivated freshwater fish species in global aquaculture. Its excellent adaptability to diverse environmental conditions, rapid growth rate, high acceptance of artificial feeds, relative resistance to diseases, and strong market demand make it a promising species for pond aquaculture. The biologically and economically valuable characteristics of common carp are of great importance for the formation of broodstock populations, the improvement of selective breeding programs, and the achievement of high productivity in intensive aquaculture systems.

The morphometric characteristics of brood fish are among the principal indicators used to assess their physiological condition, growth performance, and economic value. The comprehensive evaluation of morphometric parameters such as total length, standard length, and body weight provides valuable information on the developmental status of fish, the influence of environmental conditions, and the effectiveness of feeding regimes. Based on these parameters, the determination of length–weight relationships, the assessment of allometric growth patterns, and the calculation of condition factors are among the most widely applied scientific approaches in fisheries research and aquaculture.

Although numerous studies have been conducted in different countries on the morphometric variability, growth dynamics, and length–weight relationships of common carp, their findings often vary considerably depending on climatic conditions, the hydrochemical characteristics of water, feeding technologies, stocking density, and management practices. Therefore, establishing a regional scientific database that reflects local environmental conditions is essential for the effective management and sustainable development of the fisheries sector.

In the Republic of Uzbekistan, the development of fisheries, the expansion of productive pond aquaculture, and the improvement of broodstock quality have been identified as priority areas of national policy. In this context, the scientific evaluation of the biological characteristics, growth performance, and morphometric traits of fish under local environmental conditions is of considerable practical importance.

In particular, a comparative assessment of the morphometric characteristics of common carp cultured in fish farms operating in the Tashkent region provides an opportunity to evaluate the effectiveness of the production technologies currently employed. The present study was conducted to investigate the morphometric characteristics of common carp reared at the **Khorrot Fish**, **ZAFARASAD**, and **IMKONBALIQ FAYZ** fish farms located in the Tashkent region of Uzbekistan.During the study, data on total length, standard length, and body weight were statistically analyzed to evaluate differences among the fish farms, characterize growth performance, and determine the length–weight relationships of the cultured fish. The findings of this study provide a scientific basis for the selection of high-quality broodstock, the improvement of growth performance, and the optimization of pond aquaculture technologies under the environmental conditions of the Tashkent region.

Materials and Methods: The study was conducted in October 2025 at the **Khorrot Fish** LLC, **ZAFARASAD** Farming Enterprise, and **IMKONBALIQ FAYZ** LLC fish farms located in the Tashkent region of Uzbekistan. The study focused on common carp (*Cyprinus carpio* L., 1758) reared under pond culture conditions. A total of 105 fish specimens were examined, with 35 individuals randomly selected from each fish farm. Fish samples were collected between 11 and 15 October 2025.

For each specimen, total length (TL, cm), standard length (SL, cm), and body weight (W, kg) were recorded. Total and standard lengths were measured to the nearest 0.1 cm using an ichthyological measuring board, while body weight was determined to the nearest 1 g using a digital electronic balance. All measurements were performed according to a standardized protocol. The recorded data were initially entered into field data sheets and subsequently transferred to an electronic database for further analysis.To evaluate the nutritional status and physiological condition of the fish, Fulton's condition factor (K) was calculated using the following equation:

[K=\frac{W\times100}{L^{3}}]

where K is Fulton's condition factor, W is body weight (g), and L is total length (cm).

The length–weight relationship was estimated using the regression model proposed by Le Cren (1951):

[W=aL^{b}]

where *W* is body weight (kg), *L* is total length (cm), *a* is the regression constant, and *b* is the allometric growth coefficient.

The growth pattern was interpreted according to the estimated value of the allometric coefficient (*b*). Growth was considered **isometric** when $b = 3$, **positively allometric** when $b > 3$, and **negatively allometric** when $b < 3$.For each fish farm, descriptive statistical parameters, including the mean (M), standard deviation (SD), standard error (SE), coefficient of variation (CV, %), and minimum and maximum values, were calculated for all morphometric measurements. The relationships among total length, standard length, and body weight were evaluated using Pearson's correlation coefficient (*r*). The goodness-of-fit of the regression model was assessed by the coefficient of determination (R^2).The statistical significance of differences in morphometric characteristics among the three fish farms was determined using one-way analysis of variance (One-way ANOVA). Pairwise comparisons between groups were performed using Student's *t*-test. Differences were considered statistically significant at $P < 0.05$.m All statistical analyses were performed using **Microsoft Excel 2021** and **IBM SPSS Statistics 26.0**. The results were presented in the form of tables and graphs, and their biological and practical significance was interpreted through comparative analysis with contemporary scientific literature.

Table 1. Descriptive statistics of the morphometric characteristics of common carp (*cyprinus carpio*) from the three fish farms

Fish farm	N	Tl (sm)	Sl (sm)	Body weight (kg)
Khorrot fish	35	61.35 ± 5.93	53.06 ± 5.69	3.286 ± 0.667
Fx zafarasad	35	53.78 ± 5.87	44.85 ± 4.91	2.950 ± 1.201
Imkonbaliq fayz	35	49.86 ± 5.46	41.75 ± 4.94	2.044 ± 0.923

Table 2. Statistical parameters of morphometric characteristics, condition factor, and length–weight relationship of common carp (*cyprinus carpio*) from different fish farms

Parameter	Khorrot fish	Fx "Zafarasad"	Imkonbaliq fayz
N	35	35	35
Tl (sm)	61.35 ± 5.93	53.78 ± 5.87	49.86 ± 5.46
Sl (sm)	53.06 ± 5.69	44.85 ± 4.91	41.75 ± 4.94
Body weight (kg)	3.286 ± 0.667	2.950 ± 1.201	2.044 ± 0.923
Fulton k	1.44	1.83	1.62
Person (tl w)	0.720	0.835	0.624

P-value	<0.001	<0.001	<0.001
R^2 (length–weight)	0.558	0.581	0.466
B ko`rsatkichi	1.670	2.988	2.529

TL: F = 36.03, P < 0.001 , SL: F = 44.29, P < 0.001 ,Vazn: F = 15.84, P < 0.001

Table 3. Variation range of body weight in common carp (*cyprinus carpio*) from different fish farms

Fish farm	Minimum body weight (kg)	Maximum body weight (kg)
Khorrot fish	1.60	4.98
Fx zafarasad	0.88	5.60
Imkonbaliq fayz	0.795	4.60

Results and Discussion: During the study, a comparative analysis of the morphometric characteristics of common carp (*Cyprinus carpio* L., 1758) cultured at the **Khorrot Fish** LLC, **ZAFARASAD** Farm, and **IMKONBALIQ FAYZ** LLC fish farms located in the Tashkent region was conducted. A total of 105 fish specimens were examined, including measurements of total length (TL), standard length (SL), and body weight (W).

The obtained results demonstrated that the growth performance of common carp reared in the three fish farms differed considerably. The highest average values of body length and body weight were recorded in fish from the **Khorrot Fish** farm. Fish from this farm exhibited larger body dimensions compared with those from the other farms, indicating a relatively more intensive growth process. This difference may be associated with the feeding technology applied, water quality, hydrobiological conditions of the ponds, and more favorable rearing conditions.

Common carp cultured at the **ZAFARASAD** farm showed intermediate values of morphometric characteristics. Although the values of total length, standard length, and body weight were lower compared with those recorded at the Khorrot Fish farm, the body development of the fish remained within normal biological ranges. The results obtained from this farm confirm that growth rates of fish are directly influenced by feed quality and environmental conditions within the culture ponds.

The lowest morphometric values were recorded in common carp cultured at the **IMKONBALIQ FAYZ** farm. In particular, the relatively lower body weight and length parameters compared with the other farms indicate that the growth intensity of fish was comparatively slower. This situation may be related to differences in pond hydrochemical parameters, the quality of the natural and artificial food base, stocking density, or fish management practices.

The relationship between total body length and body weight was positive in all studied fish farms. A consistent increase in body weight was observed with increasing body length. This confirms the presence of a biologically natural and predictable relationship between length and weight in common carp. A positive correlation was also observed between standard length and body weight. These findings reflect normal growth dynamics and indicate coordinated development of the main morphometric traits.

The length–weight relationship model is considered an important criterion for evaluating growth characteristics in fish. The results obtained through regression analysis demonstrated that body weight increased consistently with increasing body length. This indicates that the growth process of the studied common carp populations was continuous and that environmental and management conditions at the farms had a significant influence on body mass formation.The obtained regression relationships are of considerable importance in aquaculture practices for predicting growth rates and selecting high-quality broodstock.

The results of Fulton's condition factor analysis provided valuable information on the nutritional status and physiological condition of the fish. Individuals with higher condition factor values exhibited better body development, indicating more efficient utilization of available nutrients. Differences in the condition factor among the studied farms can be explained by variations in feeding technologies, feed quality, and the ecological status of the aquatic environment.

The obtained results are consistent with findings from international studies. Research conducted in different countries has demonstrated that the morphometric characteristics of common carp vary depending on water temperature, feed quality, stocking density, and the hydrochemical composition of the aquatic environment. Similarly, the differences observed among the fish farms in our study can be explained by the combined influence of these environmental and management factors.

The higher morphometric parameters recorded in the **Khorrot Fish** farm indicate that the application of intensive rearing technologies can provide greater biological efficiency in common carp production. Thus, under the environmental conditions of the Tashkent region, the morphometric development of common carp was found to be directly associated with the feeding and management technologies applied in fish farms.

Regular monitoring of morphometric parameters, assessment of length–weight relationships, and control of condition factors are of significant scientific and practical importance for broodstock selection, increasing fish productivity, and improving pond aquaculture technologies.

Conclusion: The morphometric characteristics of common carp (*Cyprinus carpio* L., 1758) cultured at the **Khorrot Fish** LLC, **ZAFARASAD** Farm, and **IMKONBALIQ FAYZ** LLC fish farms located in the Tashkent region were comparatively investigated. During the study, data on total body length, standard body length, and body weight of 105 fish specimens were analyzed.

The results of morphometric analysis revealed significant differences in body size and body weight parameters among the studied fish farms. The highest morphometric values were recorded

in fish from the **Khorrot Fish** farm, whereas comparatively lower values were observed in fish from the **IMKONBALIQ FAYZ** farm. These differences were associated with variations in rearing technologies, feed quality, and ecological conditions of the pond environments.A positive relationship between body length and body weight was established. The assessment of length–weight relationships was confirmed as an important criterion for describing growth patterns, selecting broodstock, and evaluating the biological condition of common carp.

The results demonstrated that regular monitoring of morphometric parameters, control of growth dynamics, and improvement of feeding technologies under pond aquaculture conditions contribute to increasing fish productivity. The application of morphometric indicators provides a scientific basis for effective selection programs and the formation of highly productive broodstock populations.

The obtained findings are of significant scientific and practical importance for improving intensive pond culture technologies of common carp, evaluating biological performance indicators, and developing recommendations aimed at increasing production efficiency under the conditions of the Tashkent region. These data can be used as a scientific and educational resource for fish farms, research institutions, and higher education establishments.

List of references

1. Froese R. Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations // *Journal of Applied Ichthyology*. – 2006. – Vol. 22, No. 4. – P. 241–253. https://doi.org/10.1111/j.1439-0426.2006.00805.x
2. Froese R., Pauly D. (Eds.). *FishBase*. World Wide Web electronic publication. – 2025. Available at: https://www.fishbase.org
3. Le Cren E.D. The length–weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*) // *Journal of Animal Ecology*. – 1951. – Vol. 20, No. 2. – P. 201–219.
4. Ricker W.E. *Computation and Interpretation of Biological Statistics of Fish Populations*. – Ottawa: Department of the Environment, Fisheries and Marine Service, 1975. – 382 p.
5. Nikolsky G.V. *The Ecology of Fishes*. – 6th ed. – London: Academic Press, 1978. – 352 p.
6. FAO. *The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action*. – Rome: Food and Agriculture Organization of the United Nations, 2024. – 266 p.
7. Boyd C.E., Tucker C.S. *Pond Aquaculture Water Quality Management*. – New York: Springer Science & Business Media, 1998. – 700 p.
8. Balon E.K. About the oldest domesticates among fishes // *Journal of Fish Biology*. – 1995. – Vol. 47 (Suppl. A). – P. 1–27.
9. Kottelat M., Freyhof J. *Handbook of European Freshwater Fishes*. – Cornol and Berlin: Publications Kottelat, 2007. – 646 p.
10. Bardach J.E., Ryther J.H., McLarney W.O. *Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms*. – New York: John Wiley & Sons, 1972. – 868 p.