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Study of the productive characteristics of grass carp *Ctenopharyngodon idella* V. cultured in floating cages in the Euphrates River / Dhi-Qar Governorate

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Abstract

The current study was conducted in the city of Nasiriyah / Dhi Qar Governorate, the Muhammadiyah region, with longitude and latitude coordinates 310041N" 461811E." It included measuring the environmental characteristics of the water in the study area, such as measuring temperature, turbidity, electrical conductivity, total dissolved solids, and dissolved oxygen. Samples were analyzed periodically every month and fish muscle tissues were analyzed. Grass carp at the beginning and end of culture. The study used young grass carp. 1765 fish with an average starting weight of 20-35 grams. They were distributed into three treatments with a culture density of 45, 52, and 50 fish/m3. Three floating cages made of galvanized iron were used. Dimensions of one cage (2). ,2,3) m^3، An Iranian-made, floating type diet containing 32-38% protein was used for feeding. The study continued for six months, starting in October 2023 until March 2024. Fish samples were weighed every 15 days for the purpose of calculating the amount of feed provided on the basis of the weight gain, 5% of the weight. In the neighborhood, water temperatures during the study months ranged from 17-22°C, dissolved oxygen recorded between 9.33-4.3 mg/l, water electrical conductivity between 1.93-1.11 ppt, total dissolved solids between 2920-2101 mg/l, and pH value of 8.2- 7.3، The results of the study were evaluated according to growth indicators (total weight gain, daily weight gain, relative growth rate, specific growth rate, feed conversion efficiency, feed conversion rate, and protein efficiency ratio) and showed that the best results for these indicators were in the treatment with the lowest culture density. We conclude that the lower density gives the best growth indicators when adopting the culture of grass carp fish in floating cages and adopting artificial feeding with the addition of jet and aquatic plants.

Keywords: grass carp fish, floating cages, growth indicators, water characteristics of the Euphrates River

i. Introduction

Aquaculture, especially fish, has witnessed a rapid growth in the world. International statistics indicate an increase in the supply of table fish by an average of 3.4% over the past, and an increase in the world population by 1.1%. In 2018, grass carp ranked first among fish farmed in freshwater and is 10% more important commercially in the world. 5% of global production, silver carp *Hypothalmichthys molitrix* ranked second with 8.8%, Nile tilapia *Oreochromis niloticus* ranked third with 8.3%, and common carp *Cyprinus carpio* ranked fourth with 7.7% of total global production (FAO, 2020). Expansion of grass carp fish farming. It grows rapidly due to its high growth rate, large size, lack of fine bones between the muscles, and feeding habits, making it an ideal species in developing countries (FAO, 2015). Grass carp feed on aquatic plants .It consumes 2-3 times its weight and may reach 4 kg in weight in one year (Bozkurt et, al.; 2017). Iraq has suitable environmental conditions for fish farming using modern intensive and semi-intensive methods, in which environmental conditions are almost completely controlled to achieve high productivity per unit area. And the decrease in exploitation of arable land. The percentage of fish production was 13.3% in 2014 of the total production. The share of cages was 85.4% and mud ponds 1.3% (Kazim, 2014). Global farming was approximately 44.2 million tons in 2012, of which 36.6 million tons were in fresh water and 5.6 million tons in fresh water. One million tons of marine farming, and China has seized 60% of the total production (Mohammed, 2016) Aquaculture provides approximately half of the specialized fish for human consumption (FAO, 2014), and these farmed fish are more efficient in converting feed proteins into proteins suitable for

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consumption (Waite et al., 2014). The lack of spread of fish farming projects in Iraq, whether in ponds or cages, as a result of low water productivity. Due to natural pollution and overfishing (Al-Hamiri, 2011), and the intense demand for animal proteins and the need to feed billions of food security challenges (Mathiesen, 2015), the gap between food production and consumption is one of the most important challenges facing the process of economic and social development in Iraq, and the continuation of this The gap means continued dependence on abroad, which has placed a burden on the state budget In order to achieve food security in fish, we must focus on local capabilities in producing this important food commodity by maximizing the use of local fish-producing resources, of which aquaculture comes first. Although the widespread spread of fish farming in floating cages locally, it cannot meet local demand because it requires... According to correct scientific guidance, Iraq's need for fish is 150,000 tons. It produces 63,000 tons locally, and this represents 42% of its total need. Therefore, it requires importing 87,000 tons to meet its need for fish (Iraqi Ministry of Agriculture ، 2016 (This sector is one of the axes of social and economic development in many countries of the world in general and Iraq in particular due to the availability of the most basic components, which are water and human resources. With the increase in demand every year for fish, fish production must be doubled to approximately 40 million tons of fish in addition to the current production (FAO ،2016)

ii. Materials and working methods

The study was conducted in the Euphrates River in Dhi Qar Governorate, the city of Nasiriyah, in one of the fish farming farms belonging to the private sector (Haji Ma'an Farm) in the Muhammadiyah area, behind the Turkish Hospital, 3 km from the highway bridge. Three cages were identified for the study out of 20 cages made of galvanized iron, size 12. The fish were distributed among the treatments: the first treatment (T1, with a culture density of 50 fish/m3), the second treatment (T2, with a culture density of 52 fish/m3), and the third treatment (T3, with a culture density of 45 fish/m3). The fish were fed on commercial feed of Iranian origin, of the floating type. Protein content 38-32%, feeding is done manually and the feed is divided based on weight gain 5% of live weight Two meals each day, early in the morning and after noon. Samples of fish were taken from each cage and the weights were recorded every 15 days to increase the amount of feed provided. The study lasted 180 days. Completely randomized design (CRD) and statistical analysis (SAS) were used to analyze the data. Averages of coefficients were compared using the Duncan test .(١٩٥٥)

Feed ingredients used) 1 (Table
Chemical analysis for feed) 2 (Table

Nutrition	Amount	Amount	Nutrition
Moisture(max)	10	12	Ash
Crude protein %	38-32%	50	TVN mg\100g
Metabolisable Energy kcal\kg	3800-3600	108-106	Lysine%
Crude fiber %	5.5	0.48-0.42	Methionine%
Crude fat	8-5	1.25-1.05	Threonine%

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%Percentage	Article
38.90	Protein
6.96	Humidity
11.35	Fat
2.93	Fibers
39.86	Carbohydrate

The energy was calculated as shown by Al-Hassan and others (2012:

Total energy intake = protein % x 5.56 + fat % x 9.2 + carbohydrates % x 4.45

Studied growth standards

Weight gain (g/fish) = final weight - initial weight

(Philipose,2013)

Daily weight gain = rate of weight gain / number of days

(Philipose,2013)

Specific growth rate in g/day = natural logarithm of final weight - natural logarithm of initial weight / time interval between the two weights x 100

(Niazie et, al.;2013)

Relative growth rate % = Final weight - Initial weight / Initial weight x 100

Feed conversion rate = amount of feed consumed in grams / body weight gain in grams (Uten,1978)

Food conversion efficiency = weight gain in grams / food intake in grams x 100) Uten,1978(

Environmental measurements of water

1- WT water temperature

The temperature was recorded daily at midday with a homemade mercury thermometer at 0-50°C.

2- pH value

Samples of river water were brought into the cages on a monthly basis and the examination was conducted in the laboratories of the Department of Environment in Dhi Qar Governorate using a German-made PH meter.

3- Dissolved oxygen concentration values (DO.(

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Use a DO meter to measure the percentage of dissolved oxygen from Germany using the Multi parameter sampler i350, and express the result in mg/L.

Unit	March	February	January	December	November	October	Month

4- Electrical conductivity EC

Use an Indian-made conductivity meter from Hanna.

5- Turbidity NTU

It was measured using a German-made Turbidity meter and is a unit-free value

6- Total dissolved solids (TDS).

Use a German device and express it in mg/l

iii. Results and discussion

Water tests

The water temperature during the months of the study ranged between 17-22°C (Table 3), which is a degree within the permissible limits in fish farming (Peteri, 2006). The pH value ranged from 8.24-7.3 inside the water of the floating cages. This value suits the nature of Iraqi waters. The same basic principle (Al-Kanani, 2015) that the floating cages do not cause changes in pH levels (Ali, 2013), while the dissolved oxygen values in the water were recorded at 9.33-4.3 mg/L, which is within the permissible limits. The fish can tolerate the sharp decrease in dissolved oxygen values. Especially in the early hours of the day, when the ratio is between 5-3 mg/L (Khan et al., 2016). Table (3) shows EC values between 1.9-1.1 ppm, which is appropriate and within the permissible limits ،.Turbidity values ranged during the study months from 11-26 NTU, and this increase is due to rainfall and soil erosion from neighboring agricultural lands (Farhan et al., 2015). Dissolved solids values ranged between 5300-2101 mg/l, and the decrease is due to seasonal changes and low temperatures in the water. These dissolved substances are associated with salinity in an ionic or non-ionic form in the water and have a close relationship with electrical conductivity (Hanaf, (2016).

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°C	22	24	21	19	28	32	**A.T**
°C	21	22	20	17	27	21	**W.T**
NTU	19	22	26	25	24	11	**Tur**
Mg/l	4.3	6.9	7.2	9.33	6.9	6.1	**DO**
Mg/l	2920	2210	2530	2580	2101	5300	**TDS**
-	7.3	8.12	8.1	8.24	7.32	7.9	**pH**
Ppt	1.51	1.42	1.26	1.34	1.11	1.93	**E.C**

Table (1-3) Physical and chemical properties of water during the months of the study

Studied growth standards
Total and daily weight gain:
From Table (3), we notice that the third treatment, 54.33 g, with the lowest culture density, outperformed the total weight gain in the month of October, followed by the second treatment, 41.33 g, and then the first treatment, 6.33 g. In November, the second treatment, 53 g, outperformed the third treatment, 46 g, which outperformed the The first treatment was 9 grams, meaning the treatment with the highest culture density. In December, the third treatment, 50 grams, with the lowest culture density, surpassed the second treatment, 38.66 grams, which in turn surpassed the first treatment, 18.66 grams. In January, the second treatment, 64 grams, surpassed the total weight gain over the third treatment, 57 grams. In the month of February, there was a high and noticeable superiority among the averages of the treatments. The second treatment exceeded, by 68.66 grams, the third and first treatment, by 17.33.30 grams, respectively. However, in the month of March, there was a significant and high improvement in the first treatment
136 grams, with a culture density of 50 fish/m3, compared to their third and second treatment counterparts, 90.66-57.66 grams, respectively. As for the monthly average rates for this trait, we note the highest rate of weight gain was in the month of March, 94.77 grams, and the lowest rate was in the month of October, and this indicates that the more the fish increased As their ability to eat food increases and their living mass increases, these fish prefer to eat food at warm temperatures, and the optimum feeding temperature for these fish is 25-30°C (Taher, 2021). When the temperature drops below 12°C, grass carp fish stop feeding. When the water temperature is higher than 20°C, there is a greater demand for food (Opuszynski and Shireman, 2019).

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Table (3) Total weight gain rate of grass carp fish
Densities were 45, 52, and 50 fish/m3, respectively, during the study months

Rate	T3	T2	T1 Average daily weight rate	Month
33.99	54.33	41.33	6.33	
0.544	0.196	1.230	0.206	October
36	46.00	53.00	9.00	
0.919	O.176	2.286	0.296	November
35.77	50.00	38.66	18.66	December
47.33	57.00	64.00	21.00	January
38.66	30.00	68.66	17.33	February
94.77	90.66	57.66	136.00	March

From Table (4) we notice the averages of the treatments. The second treatment with a culture density of 52 fish/m3 was superior to most of the months of the study except for January. The third treatment outperformed the second treatment, which in turn outperformed the first treatment. This explains what was mentioned by (Merdas and Al-Janabi, 2012) that the best increase Weight of fish at a culture density of 55 fish/m3 in floating cages, and the results of weight gain are relied upon by researchers and breeders for the purpose of evaluating the food provided to fish (Hamid, (2020). From the general average for the months of the current study regarding the daily weight gain characteristic, it gradually takes the lowest percentage from the first month and increases until the highest daily weight gain is reached in the month of March, meaning that the fish’s ability to eat food increases with age and the temperature rises to permissible limits.

Table (4) Average daily weight gain of grass carp fish for the treatments (with a culture density of 45,52,50 fish/m3) during the months of the study

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1.080	0.676	1.950	0.616	December
1.086	1.320	1.243	0.696	January
1.450	0.583	3.196	0.573	February
4.786	3.686	6.143	4.530	March

Specific growth rate

From Table 5, the second treatment outperformed the first treatment by 0.524 g/day, which in turn outperformed the third treatment in October. In November, the first treatment outperformed the second and third treatments by 0.463 g/fish, and in December the second treatment outperformed by 0.921 g. / fish for the third and first treatment, respectively. In the month of January, the third treatment exceeded 0.780 g / fish over the first and second treatments, and in February the first treatment exceeded the second and third treatments by 0.303, while in the month of March the first treatment exceeded the third and second treatments by 1.336, respectively, and the average Year over month, the highest rate of qualitative growth was recorded in the month of March, 0.954, and the lowest rate in the month of February, 0.268. The results of the current study agreed with the study Hussain *et, al.*; 2020) (The value of the specific growth rate of grass carp fed on manufactured diets was 1.34.

Table (5): Average specific growth rates of grass carp fish for the treatments during the months of the study

Rate	T3	T2	T1 Specific growth rate	Month
0.461	0.343	0.524	0.516	October
0.335	0.250	0.293	0.463	November
0.748	0.663	0.921	0.660	December

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0.547	0.780	0.371	0.490	January

Rate	T3	T2	Averages Relative growth rate T1	Month
0.268	0.240	0.263	0.303	February
0.954	0.984	0.543	1.336	March

Relative growth rate

From Table (6), the first treatment outperformed the second and third treatments by 46.63% in the month of October, respectively. In the month of November, the first treatment outperformed the second and third treatments by 38.53%, and in the month of December the first treatment outperformed the third and second treatment by 65.29%, and in the month of December In the second, the third treatment outperformed the second and first treatments by 72.88%, and in the month of February the first treatment outperformed the second and third treatments by 23.80%, while in the month of March the first treatment outperformed the third and second treatments by 151.46%, and the general rate was highest in the month of March, 98.75%, and the lowest rate in the month of February. It is consistent with the study of Ghulam (2020) that the relative and specific growth rates are higher at medium culture densities

Table (6) Averages of the relative growth rate of grass carp fish for treatments with a culture density of 45,52,50 fish/m3 during the months of the study

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31.28	27.93	19.29	46.63	October
27.07	19.65	23.04	38.53	November
54.63	59.56	39.06	65.29	December
54.24	72.88	47.00	42.86	January
21.05	18.60	20.76	23.80	February
98.75	97.77	47.04	151.46	March

Food conversion rate
From Table (7) the food conversion rate for the transactions, we notice that the third treatment outperformed the first and second treatment by 74.8, according to the order of the transactions from largest to smallest. In the month of November, the third treatment outperformed the first and second treatment by 92.566, while in December and January the first treatment outperformed by a rate of 20.066.33.95 over third treatment, in turn, outperformed the second treatment for two months in a row. In February, the third treatment outperformed the first treatment by 23.653, while in March, the second treatment outperformed the third treatment by 3.866, slightly over the third treatment, in which the last outperformed the first treatment, and the overall average for the food conversion rate characteristic was higher in October, 46.97. Its lowest value was in the month of March 3.37. It is clear from the above that most of the increase was in the lower culture density of 45 fish/m3. Increasing the conversion rate by using submersible feeds, which have a better food conversion rate than floating feeds, also increases in the lower culture density (Fahd and Shuhaib, 2021; Ghulam, 2020).

Table (7) Average feed conversion rates for treatments with a culture density of 45,52,50 fish/m3 during the months of the study

Rate	T3	T2	Average feed conversion rate T1	Month
46.97	74.800	6.533	59.600	October
45.79	92.566	5.650	39.183	November

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19.49	20.820	3.700	33.956	December
10.47	10.633	0.733	20.066	January
15.25	23.653	1.966	20.133	February
3.37	3.650	3.866	2.603	March

Feed conversion efficiency

From Table (8) average coefficients for food conversion efficiency: the first treatment outperformed in most of the months of the study except for December. The second treatment outperformed the first and third treatments, and in January the third treatment outperformed the first treatment, which in turn outperformed the second treatment, meaning that the best food conversion efficiency. The treatment with a culture density of 50 fish/m3 gave the highest rate during the study months in March, 25.12, and recorded the lowest rate in October, 1.56. These results differ with what Nasser (2023) mentioned in his study of grass carp fish. The treatment with the lowest density was superior in most cases. Studied growth standards for the rest of the transactions It is consistent with the study of Nasser (2022) that the best weight gain in the least dense cages was 21 fish per cubic meter over the rest of the treatments, and it also outperformed most of the growth standards except for the efficiency of food conversion, so the treatment with the highest culture density was the best.

Table (8): Average feed conversion efficiency for treatments farmed at a density of 45, 52, and 50 fish/m3

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Protein efficiency ratio

From Table (9) we notice that the second treatment was significantly and significantly superior when comparing the averages between the treatments. That is, the treatment with the highest culture density

Rate	T3	T2	T1	Month
1.56	1.50	1.40	1.80	October
7.67	1.33	1.13	20.57	November
5.38	5.08	5.73	5.33	December
6.51	10.08	3.46	5.99	January
4.18	4.41	3.20	4.94	February
25.12	27.66	8.86	38.85	March

of 52 fish/m3 outperformed the first treatment, which in turn outperformed the third treatment. The study recorded the overall rate of protein efficiency ratio during the months. It was the highest rate in In December, it was 8.002, and the lowest rate in February was 1.33. The percentage of protein in the current study is 38-32%, and this percentage differs with the study (FAO, 2022), which stated that the ideal percentage of protein in diets for common carp fish ranges between 38-31% and grass carp fish. 43-41%, and increasing after that is useless ،It is consistent with the study of Assal (2023), which showed that the percentage of protein in the diet of grass carp fish is 35%, which is optimal, and that percentages of 25.20% are not sufficient to meet the nutritional needs of grass carp fish .

Table (9): Average protein efficiency ratio for the studied treatments during the study period

Rate	T3	T2	T1	Month
2.35	0.033	6.980	0.043	October
4.72	0.026	14.07	0.066	November
8.002	0.128	23.74	0.140	December
1.558	0.256	4.26	0.160	January
1.33	0.113	3.77	0.133	February
2.535	0.723	5.81	1.073	March

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https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.323

iv. References

Al-Kanani, Hassanein Ali Abdel-Aali (2015). Qualitative characteristics of woolen textile factory wastes and their effect on the waters of the Euphrates River at the center of the city of Nasiriyah, southern Iraq, Master's thesis, College of Science/Dhi Qar University, 183 pages .

Hamid, Ramadan Miteb (2020). The effect of mixed culture of carp species raised in floating cages, Master's thesis. College of Agriculture. Diyala University, 86-1 pp .

Hanaf, Raja Abdul Kadhim ((2016). The relationship between some heavy elements and the productivity of phytoplankton and the biomass of some aquatic plants prevalent in selected areas of the Shatt al-Arab / southern Iraq. Doctoral thesis, College of Agriculture, University of Basra. 195 pages.

Ali, Imad Kazem (2013). Studying some of the environmental impacts of fish farming in floating cages on the waters of the Tigris River passing through Baghdad Governorate. Master's thesis. College of Agriculture. University of Baghdad. 114 p.

Asal, Zaid Fadam (2023). The effect of diet protein levels on growth parameters and blood characteristics of grass carp *Ctenopharyngodon idella* cultured in mud ponds in Basra Governorate. Doctoral thesis. College of Agriculture, University of Basra.

Ghulam, Qusay Ali Muhammad (2020). The effect of culture density on the growth parameters of common carp (Cyprinus carpio L.) cultured in a closed alum system. Master's thesis. College of Agricultural Engineering, Animal Production. University of Baghdad.

Farhan, Taha Yassin; Abbas, Louay Muhammad; Halios, Dhalal Muhammad (2015). Mixed culture of multiple densities of common carp Cyprinus carpio L and silver carp Hypophthalmichthys molitrix in floating cages in the Euphrates River - Al-Muthanna Governorate. Al-Muthanna Journal of Agricultural Sciences. Volume (3) Issue (1). 85-90 pages .

Kazem, Dalal Hassan (2014). Geographical analysis of fish farming in Iraq for the year 2014. Uruk Journal of Human Sciences, Volume 9: 483-514

Merdas, Yahya Abbas; Al-Janabi, Thamer Karim (2012). Comparison of using three densities of carp for rearing in floating cages in the Euphrates River. Karbala University Scientific Journal (2): 16-19 pp.

Muhammad, Muhammad Hato (2016). A field study of fish farming in floating cages in Maysan Governorate for academic studies. 139-120:(15) 30 .

Iraqi Ministry of Agriculture, General Authority for Fish Resources Development (2016). Annual statistics for fish farms, a report submitted by the General Authority for Fisheries Development in Iraq, 1 page.

AL- Humiri , Kazem Obaid Matar (2011) . Technical and economic assessment of fish seafaresin Babil Governornte .master degree, Technical college /Musayyib .

Alhassan, E. H. ; Abarike,E. D. and Ayisi,C. L. (2012) . Effects of stocking density on the growth and survival of *Oreochromis niloticus* cultured in hapasin a concrete tank. African journal of Agriculture Research , 7(15) : 2405-2411 .

Bozkurt , Y., Yavas , I . , Gul , A ., Balc , B . A . and Cetin , N. C . (2017) . Importance of grass carp (*Ctenopharyngodon idella*) for controlling of aquatic vegetation . chapter 3 ,pp : 29-39 . -http : dx . doi . org / 10.5772 / intechopen . 69192

Duncan DB.(1955) . Multiple Range and Multiple F-Test Biometric ,11:1-12 .

FAO (2022) .Ctenopharyngodon idella . Cultured Aquatic species In formation Programme . Text by Weimin , M ..Fisheries and Aquaculture Division (online) . Rome Updated 2004 - 12 – 15 (Cited Friday ,October 14th 2022) .

FAO (2020) . the state of world fisheries and Aquaculture . food and Agriculture Organization of the United Nation . Rome, 206 pp .

FAO (Food and Agricultural Organization) (2015). Cultured aquatic species in formation programme . *Ctenopharyngodon idellus* . FAO fisheries and Aquaculture Department . (Italy) . (accessed September 2016) .

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 13, Issue 2 (2024) PP 523-535
https://jam.utq.edu.iq/index.php/main https://doi.org/10.54174/utjagr.v13i1.323

FAO (2014) . Aquaculture Departement , the state of world fisheries and Aquaculture .

FAO (2016) . Food and Agriculture Organization of the United Nations . the state of world fisheries and Aquaculture , fish . Aquac . Depar .,Rome , 8p.

Fahad, K.K. & Shuhaib, Z.O.(2021) . Cultivation of different densities of common carp Cyprinus carpio L. 1758 in floating cages in the Euphrates River in Nasiriyah Ctiy . University of Thi-Qar Journal of agricultural research. Volume 10, lssue 2 pp16-24 .

Hossain ,M. M.;Ali , M. L. ;Khan, S.;Haque , M. M. and Shahjahan ,M.(2020) . Use of Asian water grass as feed of grass carp .Aquaculture Reports , 18 , 7 pp .

Khan , M . N .; Shahzad , K . ; Chatta , A . ; Sohali , M .; Piria , M . and Treer , T . (2016) . A review of introduction of common carp *Cyprinus carpio* in Pakistan : Origin , purpose , impact and management . Croation Journal of Fisheries , 74 :71-80 .

Mathiesen , A. M . (2015) . The state of world fisheries and aquaculture 2012.

Nassir ,M. J. & Fahad , k. k. (2022) . Some Heavy metalsmeasurement (Cadmium , Copper and Zinc) in tissues of common carp Cyprinus carpio L.1758 farmed in floating cages in Euphrates River . Latin American Journal of Biotechnology and life Sciences , Bionature lssue 1 Vol. 8 No 1.pp 1-8

Niazie, H. N. ;M. Imanpoor ; V. Taghizad and V. Zadmajid (2013) . Effect of density stress on growth Indices and survival rate of Goldfish *Carassius auratus*. Global Veterinaria .10 (3) : 263-371 .

Nasser, Z.H. &Fahad, K. K. (2023). Stuy of the heavy metals concentration level in the water and sediment and some tissues of the grass carp *Ctenopharyngodon idella* cultured in cages in the Euphrates River .IOP Conf . Series : Earth and environmental Science 1262, 072064 .doi : 10 .1088/1755-1315/1262/7/072064 .

Opuszynski , K. and Shireman , I . V. (2019) . Herbivorous fishes : culture and use for weed management . CRC press, 223 pp .

Philipose , K . K. ; S . R . K . Sharma . ; J . Loka . ; Divu . ; N . sadhu and P . Dube . (2013) . Culture of Asian Seabream (Latas calcarifer , Bloch) in open sea floating net cages off karwar , south India . Indian Journal fish , 60 (1) : 67-70 .

Peteri , A. (2006) . Inland water Resources and aquaculture service (FIRI) Cultured aquatic species Fact sheets FAO Rome . http : www .fao .org. fi. fi. Gis .

Taher , M . M . (2021) . Effects of fish weight and water temperature on feed intake of grass carp , *Ctenopharyngodon idella* (Cuvier and Valenciennes , 1884) . Journal of Basrah Researches (sciences) , 46 (2) , 103-114 .

Uten ,F. (1978) . Standard methods and terminology in fish nutrition from : proc . World Sump . On Fish Nutrition and fish feed technology Hamburg., 20-23 .June 1978 .Vol .11 Berlin , 1979 .

Waite, R . ; Beveridge , M . ; Brummett , R . ; Castine , S . ; Chaiya wannakarn , N . ; Kaushik , S . … and Phillips, M . (2014) . Improving productivity and environmental performance of aquaculture. world fish.