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STUDY OF SOME MORPHOMETRIC FEATURES AND FEEDING HABITS OF *Cyprinus carpio* (Linnaeus, 1758) AND *Coptodon zillii* (Gervais, 1848) COLLECTED FROM TIGRIS RIVER, IRAQ

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Abstract. The present study attempts to identify the relationship between some phenotypic measurements of the two species , Common carp ***Cyprinus carpio*** and ***Coptodon zillii***, and the feeding habits of these two different species in terms of mouth shape, mouth depth and some of the vital characteristics of these two species related to the way they feed, especially total Length and weight, in the Iraqi inland water environment, specifically from the Tigris River.

Key words: feed, bones, mouth size, phenotype, water environment.

Introduction

It is well known that the nature of the feed that pertains to one species of fish determines the shape and size of the mouth in fish, as well as the location of the mouth, whether it is anterior, middle or lower end position for bottom feeding fish. The depth of the mouth cavity is also related to the type of food and nutrition obtained by fish,(1) and (2). Some species are carnivorous, herbivorous, and omnivorous, as studies indicate that there is a significant correlation between fish mouth size and total body length; the longer the fish the bigger in size it mouth, according to fish species. (3).

The skull, in vertebrates in general, protects the brain and the thin sensory organs (4). The skull is divided into two parts: the nerve skull, which includes the brain, nerves, and sensory organs. The second part includes the facial and jaw bones (5). The shape of fish skull is affected by firstly: genetics and the type and nature of food in; secondly: addition to the quality and nature of the water (6).

The development of fish skull is closely related to the development and growth of fish bones. Many studies and morphological studies have identified many fish families that researchers have diagnosed and studied, such as the two families of Cyprinidae (7); (8) and Cichlid family (9). It is possible to identify and infer some bone diagnostic differences between fish species through the use of radiography technology (X-rays), by x-raying bones, especially head bones, including the skull, jaws, and the depth of the mouth, and studying the shape of the head to diagnose differences among different species of fish (10).

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The mouth is an important indicator for some vital measurements related to fish environment. Mouth size measurements are good indicators to measure the amount of food consumed by the fish, the type of food, and the prey that the fish prefer. It depends on fish species; whether it is carnivorous or not , and according even to the location of fish in water column and its presence in a specific location in the aquatic environment, and according to even the size and type of fishing hooks employed according to the type and location (3) and (11).

Materials and Work Methods

Ten fish were collected for both species *C. carpio* and *C. zillii*, from the Rashidiya district, northeast of Baghdad, and Thira'ah Tigris, from Taji district, north of Baghdad. Both locations are on the Tigris River. Some vital measurements of the sample are collected from the two areas. A Radiography device (Carestream Vita Fhex) was used to radiography the study samples.

Results and Discussion.

Analysis of variance revealed significant differences between *C. carpio* and *C. zillii* in terms of total length, head length, mouth depth, mouth length and weight, as *C. carpio* outperformed *C. zillii* in most of the biological traits. It was at significant degrees at ($p < 0.05$) level as in Table: (1).

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Total_Length	222.713[a]	3	74.238	48.568	0.000
	Head_Length	2.666[b]	3	0.889	8.822	0.001
	Head_Width	0.551[c]	3	0.184	0.637	0.602
	Mouth_Length	0.381[d]	3	0.127	4.201	0.023
	Mouth_deapth	2.609[e]	3	0.870	6.700	0.004
	Wieght	75077.667[f]	3	25025.889	14.978	0.000
Intercept	Total_Length	8049.132	1	8049.132	5265.890	0.000
	Head_Length	393.132	1	393.132	3902.862	0.000
	Head_Width	320.460	1	320.460	1111.222	0.000
	Mouth_Length	34.669	1	34.669	1145.680	0.000
	Mouth_deapth	330.672	1	330.672	2547.714	0.000
	Wieght	579491.008	1	579491.008	346.818	0.000
Error	Total_Length	24.457	16	1.529		
	Head_Length	1.612	16	0.101		
	Head_Width	4.614	16	0.288		
	Mouth_Length	0.484	16	0.030		
	Mouth_deapth	2.077	16	0.130		

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	Wieght	26734.083	16	1670.880		
Total	Total_Length	8615.310	20			
	Head_Length	413.790	20			
	Head_Width	338.910	20			
	Mouth_Length	36.510	20			
	Mouth_deapth	346.650	20			
	Wieght	705593.000	20			
Corrected Total	Total_Length	247.170	19			
	Head_Length	4.278	19			
	Head_Width	5.166	19			
	Mouth_Length	0.866	19			
	Mouth_deapth	4.686	19			
	Wieght	101811.750	19			

Table (1): An analysis of some biometrics shows the two species *C. carpio* and *C. zillii*

Statistical analysis of the relationship between *C. carpio* and *C. zillii* showed that some of *C. carpio* biological traits were superior to the most traits of *C. zillii* as in Table: (2) and Fig. (1). The average mouth depth in common carp is (4,45 cm); it is superior to regular tilapia (3.79 cm). The mean mouth length is (1.42 cm) in common carp, while the mean mouth length is (1.25 cm) in tilapia. Radiography of the heads of *C. carpio* and *C. zillii* showed a clear difference in the depths of the mouth between these two species, as in Figures (2&3).

Dependent Variable	Fish_Type	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Total_Length	Common Carp	23.746	0.399	22.900	24.592
	Tilapia	17.204	0.399	16.358	18.050
Head_Length	Common Carp	4.892	0.102	4.675	5.109
	Tilapia	4.158	0.102	3.941	4.375
Head_Width	Common Carp	3.954	0.173	3.587	4.322
	Tilapia	4.217	0.173	3.849	4.584
Mouth_Length	Common Carp	1.408	0.056	1.289	1.527
	Tilapia	1.279	0.056	1.160	1.398
Mouth_deapth	Common Carp	4.479	0.116	4.233	4.726
	Tilapia	3.821	0.116	3.574	4.067
Wieght	Common Carp	231.500	13.193	203.533	259.467
	Tilapia	115.958	13.193	87.991	143.926

Table (2): Analysis of the effect of the species between *C. carpio* and *C. zillii* on some biological traits

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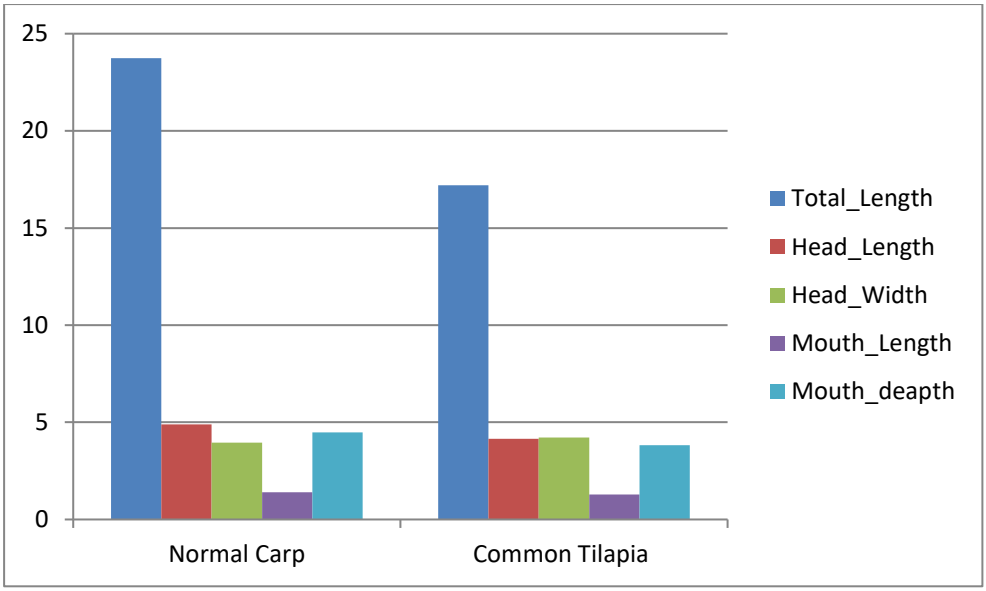

Figure (1): Diagrams to analyze the relationship between *C. carpio* and *C. zillii* for some biological traits

(12) referred to the depth of the mouth of carnivorous fish that is broader than the mouth of herbivorous and omnivorous species. This contradicts what is mentioned by this study; the mouth depth of common carp, which is one of the omnivorous fish, exceeds tilapia fish, which is carnivorous. The contradiction can be explained by the differences between the species and their sizes touched upon by both studies.

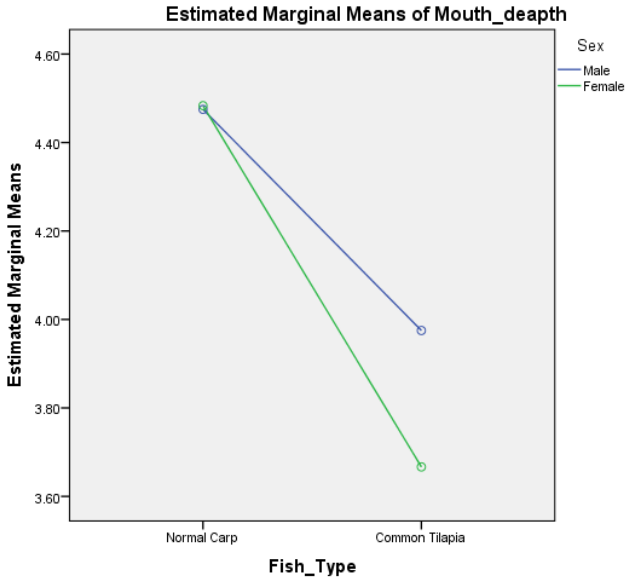

Figure (2) Depth of mouth characteristic between *C. carpio* and *C. zillii*

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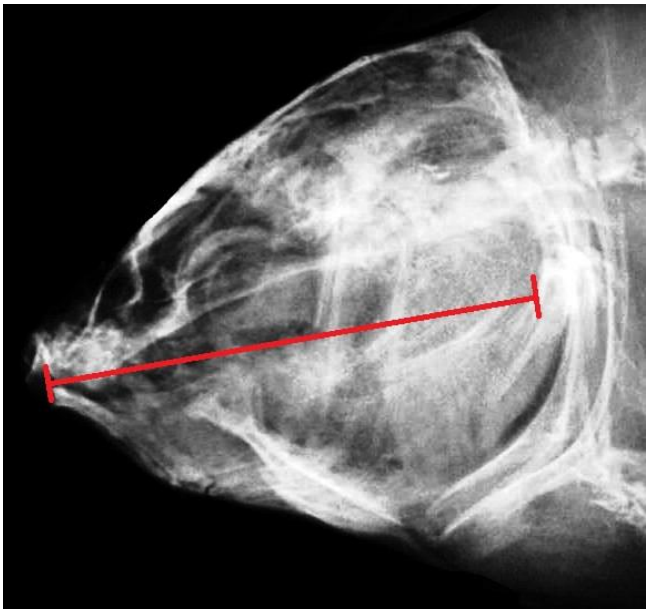

Figure (3) Radiography of the head of a *C. carpio*, showing the depth of the mouth

(11) and (13) argue that the relationship between mouth shape, size and body length determines the type and size of food, the type of food consumed and the relationship between fish species and food, especially carnivorous fish or between predator fish and their prey. It also determines the movements of fish species in the water column, whether they are pelagic, bottom or middle fish.

Figure (4) Radiography of *C. zillii*, showing the depth of the mouth

The relationship between total Length and weight gives an important vital indicator of fish. It is a reliable indicator of growth, which depends on the abundance of food and its type in the aquatic environment that contains many species of fish that differ in the way they feed and their preferred type of food. This indicator gives an indication of the changes occurring in the adaptation of the body, especially the mouth, the nature, type, abundance and volume of that food (14) and (15).

In their study, (3) dealt with seven different hosts, including three predatory species: *Alosa macedonica*, *Esox lucius* and *Perca fluviatilis*. The rates of mouth height and width were greater than the omnivorous species. (3) did not mention mouth depth in these predatory species. However, this study shows that the depth of the mouth of omnivorous species is greater than that of the carnivorous predator. The correlation between the total length of the fish and the depth of the mouth was a positive direct correlation as confirmed by (16).

The total length and weight of the two species: *C. carpio* and *C. zillii* are different; hence, the average weight of *C. carpio* samples is (233.9 ± 10g); the average weight of *C. zillii* samples is (10 ± 113.6g).); the average total length of *C. carpio* (23.78 cm) and in *C. zillii* is (17.1cm). This explains the differences between the environments from which these fish are collected; though, they are all from Tigris River. However, the specimens have been collected from different locations in Tigris River, which is identical with the studies illustrated in figures(5&6). The relationship between the total length and weight of the fish gives several essential indicators: it indicates a comparison between Aquatic environments for different species of fish and the diversity of their food in different environments. This gives us a clear idea of the effect on fish growth and the apparent increases in fish length and weight (17); (14); (18); (15).

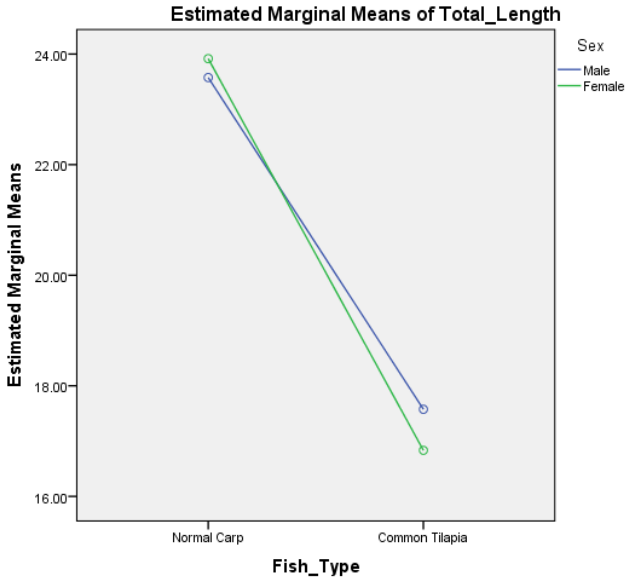

Figure 5: Total length characteristic of *C. carpio* and *C. zillii*

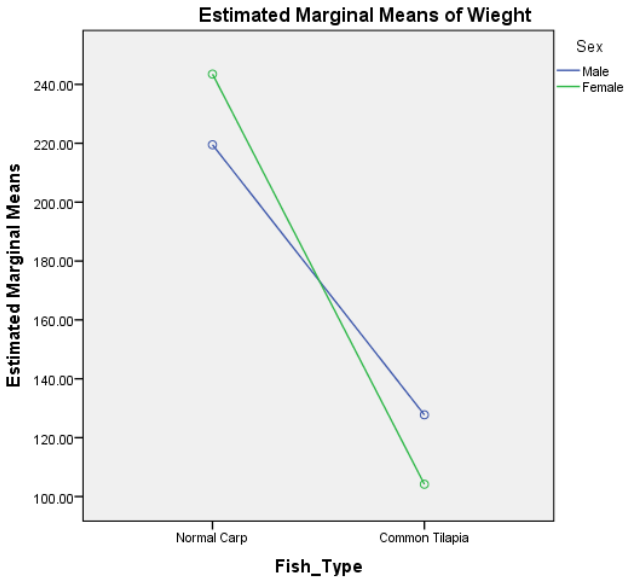

Figure (6) Weight trait between *C. carpio* and *C. zillii*

Conclusion

The two species belong to two different families: the Cyprinidae family represented by the common carp *C. carpio*, and the Cichlidae family represented by *C. zillii*. The statistical analyses of these two species show that *C. carpio* prevails in the majority of biological traits in terms of clear different relationships between the two species. The statistical analyses also show the superiority of common carp to tilapia in certain features such as the depth of mouth. It is an apparent difference between the two species; however, this result differs from some studies that have dealt with differences in mouth depth between carnivorous and omnivorous species of fish. It is possible that the differences in study results are due to the differences between the species studied; the sources are also different. Besides, it is possible that the reason is the differences in the size of fish specimens dealt with the different studies.

It is possible to conduct further research and studies concerned with the nature of fish bone formation in various species to find out discreet diagnostic and taxonomic indicators, especially among species that belong to the same family and different families. It is recommended to conduct further studies that are concerned with the nature of fish skeletons and the development secrets of these fish species which are the basis for fish phenotypic diversity. The relationship of the phenotypic diversity in its various forms of species with the nature, type and abundance of food according to the species of fish will be shed light on.

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