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# Fish Assemblage in the Euphrates River at Al-Samawa City, Southern Iraq

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**Abstract:** The study was conducted in the Euphrates river in Al-Samawa city at two stations during the period from October 2016 till September 2017. The first station (north station) was Al-Majd township (45°12'49.2"E, 31°22'14.9"N), and the second station (south station) was Al-Zaier region (45°20'21.4"E, 31°18'54.4"N). Some ecological factors were monthly recorded at the stations of the current study, including water temperature, salinity, dissolved oxygen, pH, transparency, the speed of water flow, BOD5 and total hardness. All factors except total hardness have not significant differences between two stations, The hardness in the north station showed higher (844-1475) $mg.l^{-1}$ than south station (655-1250) $mg.l^{-1}$. Fishes were collected by gill nets, cast net, hook and line, hand net and electro-fishing. A total of 4260 fish specimens were collected which belong to 24 species and 10 families, 17 species of them were native species whereas seven of them were alien species. The most abundant species was blue tilapia *Oreochromis aureus* constituted 26.84% of the total caught of a north station, The value of the dominance index (D3) in north station was 62.57%, while the most abundant species in south station was Prussian carp *Carassius auratus* constituted 27.14% of the total caught, The value of the dominance index (D3) in the south station was 56.42%.

**Keywords**: Fish population, Biodiversity, Euphrates, Ecology, Aquatic environment.

## Introduction

The biodiversity of fish assemblage in inland water bodies is influenced by the management and use of illegal fishing methods, therefor the both quality and quantity of fish assemblage structure are influenced by increasing fishing effort on the water surface (Pauly *et al*., 2002; Dudgeon *et al*., 2006). All kinds of water pollution and the presence of alien species may directly effect on the decline in numbers of fish species in rivers and lakes (Britton *et al*., 2010).

Previous studies of biodiversity in fish assemblage provided a clear results of nutritional relations such as, nature of breeding and its season, assess the levels of pollution in the aquatic environment, and understanding the effects of human intervention in the environment. In addition, to It is important to finding the means to confront these damages and protect the biodiversity by studying environmental evidence which in turn an accurate description of fish assemblage biodiversity (Kang *et al*., 2009; Sarkar *et al*., 2013).

Several studies of fish assemblage in Iraqi inland waters were conducted in the Euphrates river such as Al-Rudaini *et al*. (2001), they have recorded 17 species of fishes in the Qadisiyah Dam Lake in the Euphrates river at Anbar province. Al-Tamimi (2004) studied the biodiversity in the Euphrates river society near the Musaiab power station, and recorded 28 species.

Khaddara (2014) documented that the effect of some physical and chemical factors in the dam of Hindia in the Euphrates river on the environment and life of the fish community. The author recorded 23 species of fishes, of which 17 species belong to the Cyprinidae. Mohamed & Al-Jubouri (2017) reported the structure of fish assemblage in the Diwaniya river in the central of Iraq, they have shown that the existence of 27 species of freshwater fishes belong to eight families, including 19 native species and eight alien species, and the Prussian carp *Carassius auratus* was the most noticeable species with 14.6% of the total catch followed by *Liza abu* (=*Planiliza abu*) by 14.2%. Furthermore, *Oreochromis aureus* was the third with 11.4% of the total fish catch. They also found that a difference in the structure of the assemblage compared with studies on rivers close to the number of species in dominion and biodiversity. The structure of fish assemblage recorded 15 species in the Euphrates river before and after the dam of Hindia in Babylon province. 13 species belong to the Cyprinidae and one species belong to Mugilidae and another to the Sisoridae (Abbas *et al*., 2017).

The aim of this study is understanding the structure of fish assemblage in the Euphrates river at Al-Samawa city and estimate some ecological factors and their effects on fish assemblage.

**Materials & Methods:**

The Euphrates River is one of the main irrigation systems, feeding large areas of agricultural land in Al-Muthanna province, which enters it in the direction of Al-Hilal in the north of the province and runs south towards Al-Majd area, then enters the province of Samawa. After passing through the area of Sawyer, and continue to run the district of the Al-Khader heading to the Al-Darraji south, also the last area being conducted before entering the province of Dhi Qar is Al-Hwaishli belong to the Al-Darraji. The length of the river is about 107 km. The annual discharge rate for 2016 and 2017 is 120.18 $m^3.h^{-1}$ and 100.95 $m^3.h^{-1}$ respectively. The Euphrates River slope is 7 $cm.km^{-1}$ long (Muthanna Water Resources Department, Pers. Comm.). Two sampling stations were selected (Fig. 1).

The first station located north in the city centre of Al-Majd township within coordinates 31° 22'14.9" N, 45° 12'49.2" E, the mean width of the river in the study area ranged from 60 to 150 m and the depths ranged from 2 to 4 m, The second station located south in the city centre of Al-Zair area within coordinates 31°18'54.4" N and 45° 20'21.4" E (Fig. 1). The width of the river in the study area ranged between 50 to 150 m

and the depths ranged between 1.5 to 4 m. Two stations were characterized by the existence of agricultural areas in both sides of the river, and the buffalo growers on different areas of the banks of the river. It also observed several types of aquatic plants, such as *Phragmites australis*, *Ceratophyllum demersum*, *Eichhornia diversifolia* and *Vallisneria spiralis.* Some physical and chemical factors of water were monthly measured also fishing at both stations between October 2016 to September 2017. Water temperature and dissolved oxygen were measured in 1 $mg.l^{-1}$ unit using an American field YSI55 device. Water pH was measured using the Chinese pH meter of field origin. Salinity was measured in $gm.l^{-1}$ as PSU with EC300YSI field. Transparency was also measured using Secchi disk. Total hardness was measured by correcting a certain volume of EDTA¬-Na solution according to the method described in Lind (1979).

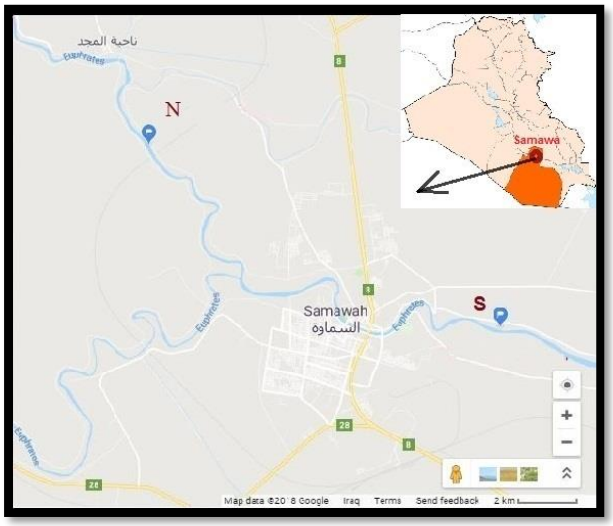


**Fig. (1): Map of study area (N: north station, S: South station).**

The fishing was using several fishing tools such as fixed gill net, with a dimensions of 1 x 60 $m^2$ with 15 mm mesh size, a floating gill net, 4 x 20 $m^2$ with 30 mm mesh size, a cast net, a diameter of 4 m with 1.5 mm mesh size, hand net for small fishes and the electric shock device connected to a battery of 12 volts and 150 Amp.

The period of sampling ranged between October 2016 till September 2017. The fishes were classified according to Coad (2010) and the scientific names were updated according to Mohammadian-Kalat *et al*. (2017) for *Alburnus sellal*, Tan & Armbruster (2018) and Fricke *et al*. (2019) were used to update the names of new families of Cypriniformes and new family Aphanidae within Cyprinodontidae. The total length of fishes were calculated using a ruler to the nearest 1mm, and the weight were measured to the nearest 1 gram.

Relative abundance, was calculated according to this evidence is based on Odum (1970)

Relative abundance (%)=(ni/N)*100

ni= number of one species individuals

N= number of total individuals

Dominance ($D_3$), the following equation (Kwak & Peterson, 2007) was used:

$D_3= [\sum_{i=1}^{3} pi.] 100$

Pi= ratio of number or weight for three species have highest abundance to total individuals.

Past3 program used to find cluster analysis of the similarities among months in fish species according to Jaccard similarity index. The same program was used to Canonical Correlation Analysis (CCA) of the relationship between species, environmental factors, number of species, number of individuals and seasons of the year.

## Results

The results showed that there were no significant differences in average environmental factors between two stations except the total hardness. The northern station

**Table (1): Comparison of the environmental factors studied in the two stations at P ≤ 0.05.**

| Parameter | North station | South station |
|---|---|---|
| Salinity | 1.56 ±0.07 | 1.67 ±0.09 |
| Temperature | 22.95 ±2.11 | 22.75 ±2.21 |
| Transparency | 37.08 ±4.99 | 41.16 ±6.23 |
| pH | 7.48 ±0.06 | 7.5 ±0.06 |
| Dissolved $O_2$ | 7.09 ±0.54 | 6.7 ±0.66 |
| BOD5 | 2.79 ±0.2 | 3 ±0.18 |
| Flow velocity | 23.32 ±1.04 | 24.67 ±1.67 |
| T. hardness | 1136 ±93.1* | 890.4 ±46.3 |

*significantly differences at level P ≤ 0.05.

**Fish assemblage**

A total of 4260 fish individuals were collected during the study period, including 17 native species and seven alien species. The northern station consisted of 2664 specimens belong to 11 families comprising 23 species, while the southern station represented 1596 specimens belong to ten families comprising 20 species. The Cyprinidae dominated with eight species followed by Leuciscidae with five species, then Cichlidae with two species, while the rest of the families represented by one species each (Table 2).

Cyprinidae species were represented by *Arabibarbus grypus*, *Carasobarbus luteus*, *Carasobarbus sublimus* (appeared at the northern station only), *Carassius auratus*, *Cyprinion kais*, *Cyprinus carpio*, *Garra rufa*, *Luciobarbus xanthopterus*. Leuciscidae represents by *Acanthobrama marmid*, *Alburnus caeruleus*, *Alburnus sellal*, *Chondrostoma regium* (appeared at the northern station only) and *Leuciscus vorax.* Cichlidae represents with *Coptodon zillii*, *Oreochromis aureus*, whereas families Aphaniidea, Bagridae, Heteropneustidae, Mastacembelidae, Mugilidae, Poeciliidae, Siluridae, Sisoridae, and Xenocyprinidae represented with *Aphanius* sp. (appeared at the north station only), *Mystus pelusius*, *Heteropneustes fossilis* (appear at the southern station only), *Mastacembelus mastacembelus*, *Planiliza abu*, *Gambusia holbrooki*, *Silurus triostegus*, *Glyptothorax* sp. (appeared at the northern station only), and *Hemiculter leucisculus* respectively.

Table (3) showed the monthly fluctuations in the number of species and individuals of fishes of the two stations, with a total of 23 species in the northern station. The number of species recorded ranged from 11 species in November and April and 18 in March. It recorded 20 species in the southern station and varied between 10 species in October, December, May and September and 15 species in February. The total number of species was 24 species for both stations, ranging from 11 species in November to 18 species in February, March, July and August. While, the total number of individuals was 2664 at the northern station, the total number of fish individuals ranged from 411 in February to 89 in August. A total of 1596 fish individuals were reported at the south station varying from 293 in January to 78 in September. The total number of individuals was 2460 for both stations, ranging from 584 in January to 181 in September.

**Table (2): The common name, scientific name, and family name of fish of the two stations (N: North station, S: South station, *: Alien species).**

| | Local name | Scientific name | Family | Station |
|---|---|---|---|---|
| 1 | Shabbout | *Arabibarbus grypus* | Cyprinidae | N, S |
| 2 | Himri | *Carasobarbus luteus* | Cyprinidae | N, S |
| 3 | Shabeeh el himri | *Carasobarbus sublimus* | Cyprinidae | N, S |
| 4 | Carp brusy* | *Carassius auratus* | Cyprinidae | N, S |
| 5 | Bunaini saghir | *Cyprinion kais* | Cyprinidae | N, S |
| 6 | Carp shaee'* | *Cyprinus carpio* | Cyprinidae | N |
| 7 | Algargor alahmer | *Garra rufa* | Cyprinidae | N, S |
| 8 | Gattan | *Luciobarbus xanthopterus* | Cyprinidae | N |
| 9 | semnan areed | *Acanthobrama marmid* | Leuciscidae | N, S |
| 10 | Lessafa | *Alburnus caeruleus* | Leuciscidae | N, S |
| 11 | semnan tuyel | *Alburnus sellal* | Leuciscidae | N, S |
| 12 | Baloot muluki | *Chondrostoma regium* | Leuciscidae | N, S |
| 13 | Shillig | *Leuciscus vorax* | Leuciscidae | N, S |
| 14 | Samenan* | *Hemiculter leucisculus* | Xenocyprinidae | N, S |
| 15 | Abu-zummair | *Mystus pelusius* | Bagridae | N, S |
| 16 | jirri lasseye* | *Heteropneustes fossilis* | Heteropneustidae | S |
| 17 | Jirri dijlah | *Silurus triostegus* | Siluridae | N, S |
| 18 | Saqanqaroor | *Glyptothorax sp.* | Sisoridae | N |
| 19 | Batrikh | *Aphanius sp.* | Aphaniidae | N |
| 20 | Mosquito fish* | *Gambusia holbrooki* | Poeciliidae | N, S |
| 21 | Marmarij | *Mastacembelus mastacembelus* | Mastacembelidae | N, S |
| 22 | Redbelly tilapia* | *Coptodon zillii* | Cichlidae | N, S |
| 23 | Blue tilapia* | *Oreochromis aureus* | Cichlidae | N, S |
| 24 | Khishni | *Planiliza abu* | Mugilidae | N, S |

**Table (3): The number of species and individuals per month in the two studied stations (N: North station, S: South station).**

| Month | Number of individuals | | Number of species | | Station |
|---|---|---|---|---|---|
| October 2016 | 361 | 249 | 16 | 16 | N |
| | | 112 | | 10 | S |
| November | 439 | 286 | 11 | 11 | N |
| | | 153 | | 11 | S |
| December | 341 | 237 | 14 | 13 | N |
| | | 104 | | 10 | S |
| January 2017 | 584 | 291 | 14 | 12 | N |
| | | 293 | | 12 | S |
| February | 506 | 411 | 18 | 14 | N |
| | | 95 | | 15 | S |
| March | 349 | 212 | 18 | 18 | N |
| | | 137 | | 13 | S |
| April | 252 | 124 | 13 | 11 | N |
| | | 128 | | 13 | S |
| May | 308 | 147 | 16 | 16 | N |
| | | 161 | | 10 | S |
| June | 286 | 164 | 13 | 13 | N |
| | | 122 | | 13 | S |
| July | 271 | 171 | 18 | 17 | N |
| | | 100 | | 13 | S |
| August | 202 | 89 | 18 | 16 | N |
| | | 113 | | 14 | S |
| September | 181 | 103 | 15 | 15 | N |
| | | 78 | | 10 | S |

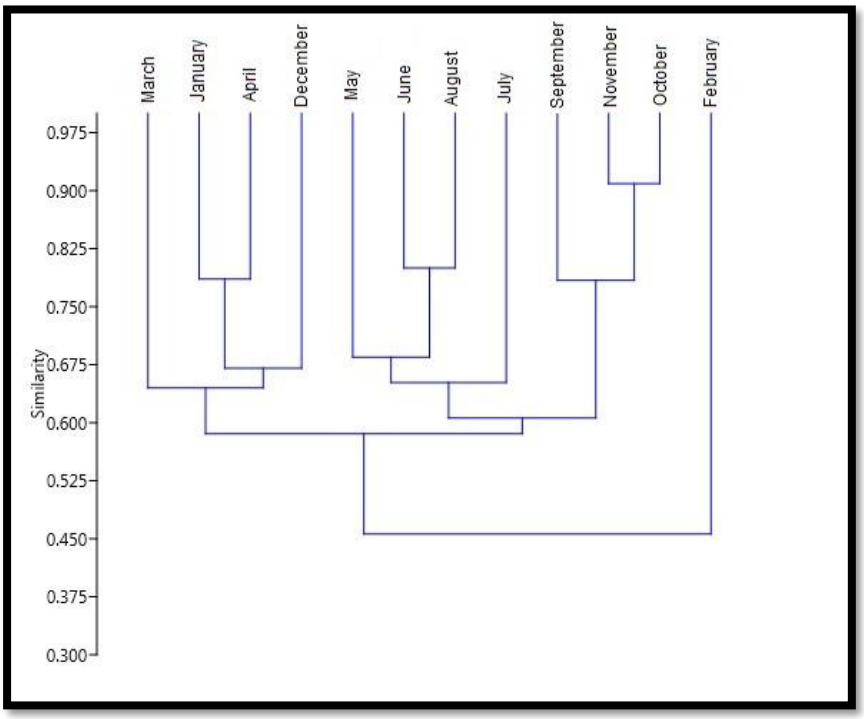

**Fig. (2): Cluster analysis of the similarities among months in fish species using the Jaccard similarity index in north station**.

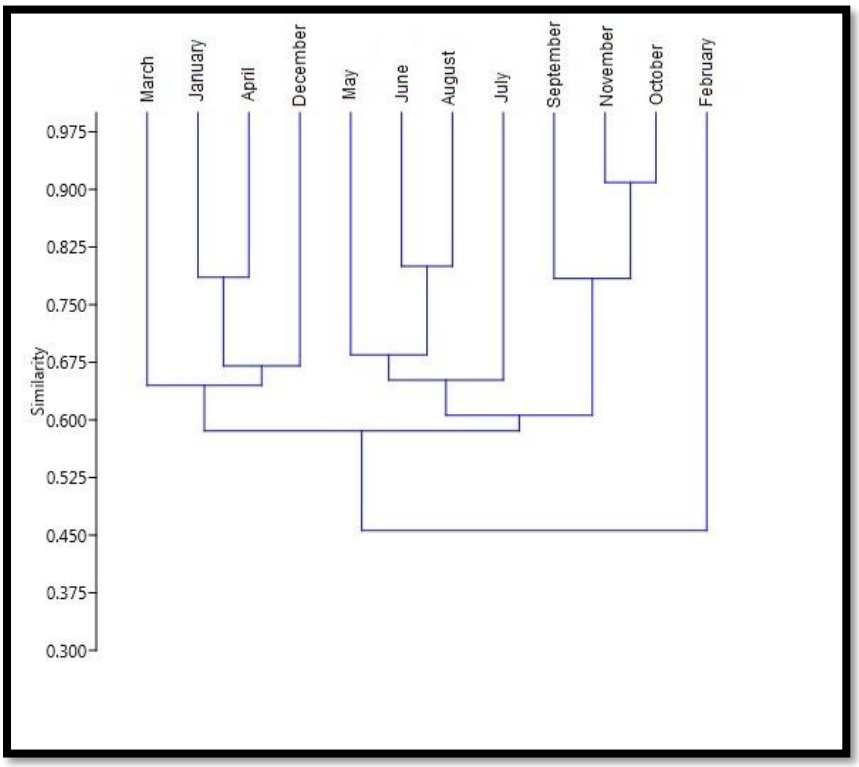


**Fig. (3): Cluster analysis of the similarities among the months in species using Jaccard similarity index in south station.**

Fig. (2) exhibited the cluster analysis of the similarity among the months in species using the Jaccard index based on the presence or absence of the species in north station. A similarity level of 70% showed the existence of four main groups. The first major group included January, the second group included October and March in a secondary group and February and January in another secondary group. The third group included August, while the fourth group included two main groups, the first of November, and the second with June and April.

Fig. (3) explained the cluster analysis of the similarities between the months in the species using the Jaccard similarity index of the southern station based on the presence or absence of the species. The first main group included February while, the second main group included two subgroups, first subgroup included October and November, and September in another group. The second subgroup included July, August, June and May. The third group consisted of December, April, January and March.

**Multivariate analysis**

Fig. (4) revealed the Canonical Correlation Analysis (CCA) of the relationship between species, environmental factors, number of species, number of individuals and seasons of the year at the northern station. The highest value of Eigenvalue Axis 1 was 70.98% and

22.04% for Axis 2, so the current figure represents 93.02% of the overall picture of the relations among all variables. In the same figure, the vertical axis divided the variables into the first two groups, which included *A. grypus*, *C. kais*, *G. rufa* and *P. abu*. Numbers of species were positively affected by three environmental factors, $BOD_5$, temperature and hardness, which greatly affected on the flow rate, and it was weak effect in Summer and Autumn positively, while salinity, transparency, pH and dissolved oxygen were negatively effect. The other group included fishes: *A. caeruleus*, *A. sellal*, *C. luteus*, *C. auratus*, *L. xanthopterus*, *L. vorax*, *M. pelusius* and *O. aureus* have been positively affected by salinity, transparency, dissolved $O_2$ and pH. They have been clearly associated in winter and a relatively associated in spring, while negatively correlated with $BOD_5$, temperature, hardness and flow velocity. There was no clear relationship among the number of fish individuals with environmental factors.

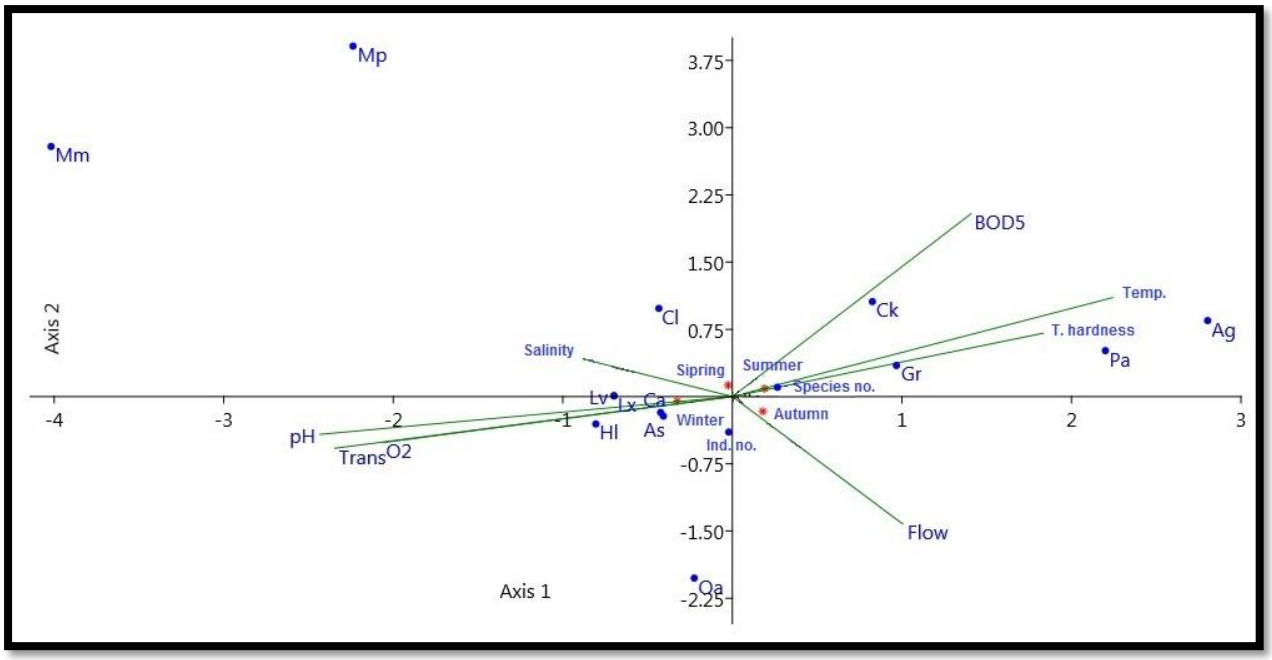


**Fig. (4): CCA analysis represents the relationship between species, environmental factors, number of species, number of individuals and seasons in the northern station.**

Fig. (5) showed the CCA analysis of the relationship between species, environmental factors, number of species and number of individuals in different seasons of the south station. The highest value of Eigenvalue Axis 1 was 66.39%, while the Axis 2 was 28.1%, so the current figure represents 94.4% of the overall picture of the relations among all the variables involved in the analysis. It appears in the same figure that the vertical axis has divided the variables into two groups, included fishes *C. luteus*, *Gambusia holbrooki* and *Planiliza abu* which positively affected by four environmental factors, namely temperature, relatively affected by salinity, hardness and BOD5, and there were clearly correlated in summer and at a minimum in spring. It also appears from the same figure that these species were negatively affected by four environmental factors such transparency, dissolved oxygen, pH and current speed. The other group included *A. sellal*, *C. auratus*, *C. kais*, *G. rufa*, *H. leucisculus*, *L. vorax* and *O. aureus*, in addition to the number of species

and the number of individuals. These variables have been positively affected by some environmental factors as transparency, dissolved oxygen, pH and current speed. This effect was correlated with winter and relatively effect in autumn. *G. rufa* significantly affected by transparency, dissolved oxygen and pH and it is less affected by flow, while blue tilapia was highly affected by flow and lower by transparency, dissolved oxygen and pH. *A. sellal*, *C. auratus*, *C. kais*, *G. rufa*, *L. vorax* and *O. aureus* were negatively correlated with temperature, $BOD_5$, salinity and hardness.

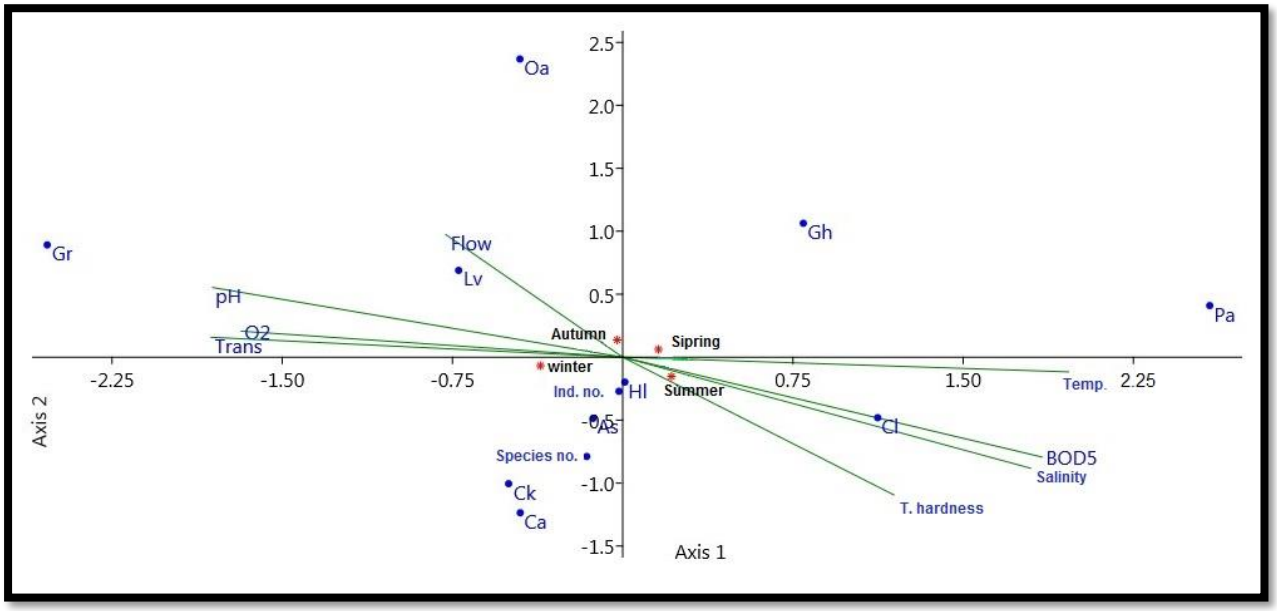


**Fig. (5): CCA analysis represents the relationship between species, environmental factors, number of species, number of individuals and seasons in the southern station.**

## Discussion

The structure of fish assemblage determined by the knowledge of the environmental changes in that society; Changes in water quality directly effect on the diversity of fishes in the river. Effective factors on the structure of fish assemblage are primary productivity, climate change, food availability. In addition to biological factors, relationships within the species and with other species (Mondal *et al.*, 2010). Fish assemblage has been shown to be influenced by their local environment characteristics such as current speed (Yan *et al.*, 2010), temperature (Wang *et al.*, 2003), Dissolved oxygen concentration (Ostrand & Wilde, 2001), the depth of the river (Harvey & Stewart, 1991), the River width (Yan *et al.*, 2010) and the discharge or flow of river water (Chu *et al.*, 2015) which might affect the diversity of fishes in the river. Chu *et al.* (2015) indicated that sewage, industrial or agricultural activities may lead to changes in the spatial characteristics of the river.

The structure of fish assemblage is associated with environmental variables including dissolved oxygen, salinity and pH (Li *et al.*, 2012). Fish is a sensitive and important component of the Keystone aquatic environment and provides an indicator of environmental changes, environmental degradation and ecosystem health of a general form (Kouamé Lan *et al.*, 2003). The current work is the first study of the structure of fish

assemblage in the Euphrates river near the city of Samawah.

The dominated fishes *O. aureus*, *C. auratus* and *A. sellal* were relative abundance in the northern station (26.84%, 18.39 and 17.34) respectively. The $D_3$ dominance index for the three species reached 62.57%. Weight of *Silurus triostegus* was 25.35% of total catch of the northern station. Despite, its few numbers, but the weights of its individuals of the large fisheries made the top of the species with its relative weight in the northern station.

As the lack of desire of consumers for these types of fish and the lack of demand for it in the local markets in Samawa and nearby provinces so fishermen refrained from fishing, allowing the individuals of the species access to large size as the length of the largest fish. As the length of the largest fish 92 cm and weight 6015 g. At the same time, the numbers and weights of economic fish such as *A. grypus*, and *L. xanthopterus* were low numbers and weights, in addition to the lack of some economic species in fishing, such as *Luciobarbus kersin*, *Luciobarbus subquincunciatus*, and *Mesopotamichthys sharpeyi*. The dominance of species varied in the southern station, with *C. auratus*, *A. sellal* and *O. aureus* with a relative abundance of 27.14%, 17.07% and 12.22%, respectively. The D3 evenness index for the three most abundant species was 56.42% of the total catch.

The current study was differed in terms of the number of species and their abundance with the study of Al-Temimy (2004) during his study of environment and biological assessment of the fish assemblage in the Euphrates River near the power station of Al-Musaiab, 28 fish species and abundance of Cyprinidae such as *A. grypus*, *C. carpio*, *C. luteus*, *L. xanthopterus* and *L. barbulus*. However Salman (2006) cited that the biodiversity of the Tigris-Tharathar Arm river, which recorded 16 species, The author showed the predominance of *P. abu* by 56.21% followed by *C. luteus* and replaced the third *C. auratus*. In addition, it differed with Lazem (2009) who studied the structure of the Garmat Ali fish assemblage and recorded 26 species. Lazem (2009) found the predominance of the *P. abu* with 39.32% of the total catch and the second *C. auratus* by 21.19% and *Poicillius sphinops* (=*Poicillia sphinops*) was third by 7%.

In current study, the recorded of species is similar with that of Al-Amari (2011) in his study of the Hilla River, he recorded 23 species and differed with it in terms of species dominance. *P. abu* dominated 61.67% followed by *C. auratus* by 10%.

*S. triostegus* was second in proportion to the weight of the total catch. The study differed with the observations of Al-Amari *et al*. (2012) in their study of the structure of the fish assemblage and some environmental index in the Euphrates river in Al- Hindia city, where they recorded 20 fish species, dominated *P. abu* with relative abundance 26.55% followed by *C. luteus* 21.04% of total catch. The recorded species in this study was higher than that recorded by Salman (2012) in his study of the fish assemblage of Sulaibiat marsh, in Al-Samawa city, when recorded 13 species, where the dominant of *P. abu* by 45.75% came *C. auratus* second by 25.02%, then *C. luteus* was third with 22.64% of the total catch.

The present study is consistent with Mohamed *et al*. (2012) on the structure of the Shatt Al-Arab fish assemblage in the dominant of *C. auratus* despite the difference in the environment and the number of species caught, as recorded at the sites of the Al-Deer

and Hamdan by 18 and 23 species, respectively. The current results coincided with Khaddara (2014) when studied the structure of fish assemblage in the Euphrates river in Al-Hindia dam where recorded 23 species of *C. auratus* by 35.2% of the total catch.

Abdullah (2015) recorded higher number than that in the current study of 33 species in the north of the Shatt Al-Arab river, indicating the abundance of *C. auratus*, *P. abu* and *C. zillii*, respectively with the relative abundance of 30.89%, 29.3% and 15.64%, respectively. Abbas *et al*. (2015) recorded eight species in the Tigris River at the dam of Kut, which is lower than recorded in the current study. It appears that the reason is the different means of fishing as they used several sizes of gill nets and drift nets and pointed to the predominance of *P. abu* by 31.3%, and *Barbus luteus* (=*Carassobarbus luteus*) second with 15.4% and third *Barbus belayewi* (= *Capoeta damascina*). Abbas *et al*. (2017) studies the structure of fish assemblage in Al-Hindia of the Euphrates river dam and recorded 15 fish species using gill nets and cast net multi-sizes, and presented *P. abu* by 14.1% followed by *C. luteus* 12.6% and *Aspius vorax* (= *Leuciscus vorax*) with 11.6% total catch,

Mohamed & Al-Jubouri (2017) recorded 27 fish species from Al-Diwaniya River, which is higher than that recorded in the current study. They have pointed that the abundance of *C. auratus* with a relative abundance of 14.55%, followed by *P. abu* 14.18% then *O. aureus* was 11.42% of the total catch, and the $D_3$ index was 40.2% for the three species that mentioned above. Abood (2018) explained the structure and distribution of the Shatt Al-Arab fish assemblage, recording 45 species in the Deer station, including 19 marine species The dominance of the first and second species agreed with the present study that the dominant of *C. auratus* in the Deer site was 21.5% of the total catch, followed by *O. aureus*, was 19.5% of total catch.

The current study coincided with the previous studies on the dominance of cyprinid fish, but it differed from most of them in their report of *P. abu* such as Salman (2006), Lazem (2009), Al-Amari (2011), Al-Amari *et al*. (2012), Salman (2012), Abbas *et al*. (2015) and Abbas *et al*. (2017), and agreed with the study of Mohamed *et al*. (2012) and Khaddara (2012) in the dominance of *C. auratus* and agreed with Mohamed & Al-Jubouri (2017) and Abood (2018) in the dominance of *C. auratus* and *O. aureus*, respectively, and this indicates the dominance of alien species and spread them in the inland water bodies, The ability to resist changes and environmental conditions and the possessions of *C. auratus* from a wide range of food, and *O. aureus* has a year-round proliferative activity As well as they resistance bad environmental conditions such as salinity, temperature and low levels of dissolved oxygen (Altun *et al*., 2006). The current study showed decreasing of local economic fishes, such as *A. grypus*, *C. luteus*, *L. vorax* and *L. xanthopterus*, and the absence of others, for instance *M. sharpeyi* and *L. kersin*. Some previous studies of the fish assemblage in the Euphrates river indicated decreasing in the number of native fishes and the emergence of a clear rule for exotic species, including the study of Al-Amari (2011), Khaddara (2012), Abbas *et al*. (2017) and Mohamed & Al-Jubouri (2017).

## Conclusion

In conclusion, aquatic environment of the Euphrates in Samawa city was different from other river's sectors, that resulted from a high level of salinity and total hardness. The fish

assemblage was different from other river's sectors in a number of species and its abundance and dominance. It is clearly that the dominance of alien species (*O. aureus* and *C. auratus*). Furthermore, there was a low abundance of economic native species such as *L. xanthopterus* and *A. grypus* and absence of *M. sharpeyi*.

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**Ethical approval**: all applicable national and international guidelines for the care and use of animals were followed.

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