



Fish base of biological indices in Atshan river near Samawa city

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Abstract

The research was piloted in Atshan river at the city of Samawah for a period of one year, starting from October 2020, monthly samples were taken and included some ecological factors dissolved oxygen varied between 9.6 mg. l⁻¹ in winter and 4.9 mg. l⁻¹ in summer, while the pH was recorded in moderate ranges tending to light basal during the different seasons, as it was within the range 7.7 in winter and 1.7 in spring. As for salinity, it varied between 2.5 parts per thousand in the summer and its lowest level in the winter was 2 parts per thousand. As for water temperatures, it varied between 32.5 degrees Celsius in the summer, and its lowest value was recorded in the winter 14.1 Celsius. Fish number caught was 1055 fish belonging to 12 species Occurrence shows that resident group includes four species and the seasonal group includes three species, whereas the rare group includes five species. Dominance index (D3) value reached 77% for the three most abundant species, *O. aureus*, *C. auratus* and *C. luteus*. Richness index (D) vary between 1.34 in autumn and 1.51 in summer, while Diversity index (H) records highest value in summer 1.68 and lowest in Spring 1.34. Evenness index (J) varied in summer 0.86 and 0.64 in winter. The dominance of exotic species in the Atshan River, represented by blue tilapia and Prussian carp, and a decrease in the number and abundance of local species, and the absence of some of them in the fishing sample, such as carp and brown, which threatens some species with extinction, as well as a significant decrease in the evidence of the biodiversity of Atshan river fish as recorded in the river An increase in salinity compared to the waters of the Euphrates River in Samawa. This research deals for the first time with biodiversity in Atshan river.

Keywords: fish, biodiversity indices, Euphrates, water environment, Atshan river

Introduction

Fish diversity is a criterion for the health of the aquatic environment. The higher the diversity, the higher the water body has natural environmental specifications suitable for living aquatic organisms and practicing their vital activities (Masalimova *et al.* 2019) ^[5], and provides an appropriate environment for the preservation and sustainability of species, and thus is a cornerstone of the aquatic environment (Zaitseva *et al.* 2018) ^[2]. Preserving the aquatic environment in an ideal manner and preserving its vital and abiotic characteristics requires concerted efforts to protect it from pollutants resulting from human activities such as agriculture, factory waste and sewage (Yorov *et al.* 2019) ^[3], as well as from excessive fishing and illegal uses of water bodies and encroachment on bodies of water that harbor living organisms and represent the natural habitat. On the other hand, the invasive organisms of the aquatic environment may cause great harm to local species through competition for food sources, place or predation, which exposes local species to migration or extinction (Simovic *et al.* 2017; Britton *et al.*, 2010) ^[1]. Kantharajan, *et al.* (2022) ^[6] Salim explained that the preservation of the genetic resources of local species is preferable to some water bodies as natural reserves to preserve the species and their abundance and the biological diversity in these water bodies. Dealing with these challenges requires several interrelated steps, starting with survey studies, and then evaluation through biodiversity evidence, which leads to important decisions to determine the correct management method to preserve diversity (Sarkar, *et al.* 2013) ^[7]. Several studies have dealt with biodiversity in the Euphrates River and its branches. Diversity evidence was used in conducting it, and it showed a discrepancy with the passage of time and the effect of the study site relative to the course of the river in the rise or fall of the values of these evidences, and pollution had a clear impact on that, and on the other hand was the great effect of species The intruder on the aquatic environment has a significant impact on the evidence of sovereignty, diversity, equality and rich evidence (Al-Helli, *et al.* 2019; Mohamed & Al-Jubouri, 2017; Khaddara, 2014; Abbas *et al.* 2017) ^[11, 9, 10].

Aim study: is understand Biodiversity of fish and its relationship with ecological factors.

Materials and Methods

Atshan River branches from the Euphrates River in Al-Qadisiyah province and enters Al-Muthanna province at the Crescent region and extends in the lands west of the province to flow into the Euphrates River again near the

center of Al-Muthanna province, and the length of the river reaches about 105 km. A suitable area was chosen in the last part of the river near Umm al-Akf area within coordinates 31°18'12.0"N 45°11'11.4"E (Fig 1).

Monthly samples were taken in the last ten days of each month starting from October 2020 for a period of one year. The samples included the main environmental factors of water, which are water temperature, dissolved oxygen by portable YSI55, salinity by portable EC300YSI and pH by pH meter, while fish samples were collected using multi-measurement nets in addition to the electroshock device. And with a constant fishing effort for one hour, it covered an area of one kilometer of the river section on both banks

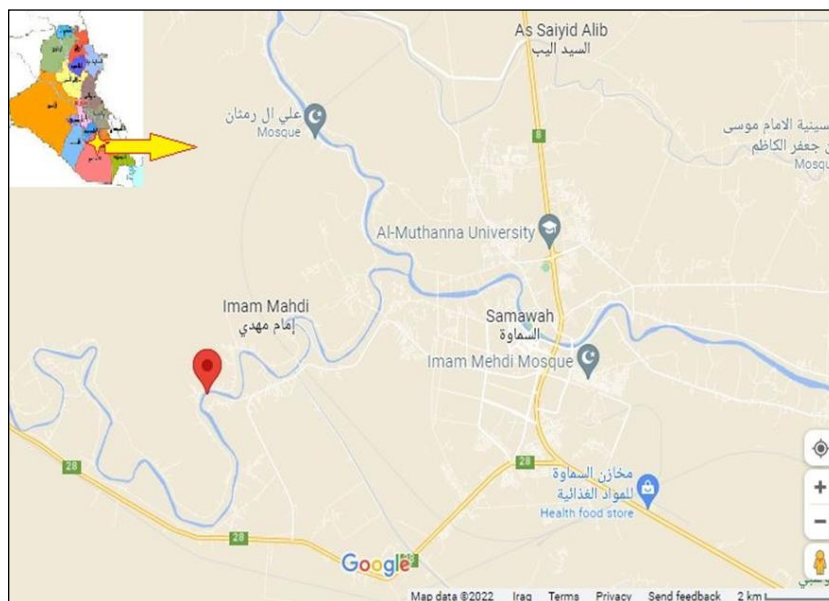


Fig 1: site of study (google map 2022)

Coad (2010) ^[12], Tan and Ambruster (2018), Froese and Pauly (2022) ^[15], Mohammadian-Kalat *et al.* (2017) ^[13] used to classify fish species according to modern classification.

occurrence (Tyler 1971) ^[17], Relative abundance (Odum, 1970) ^[16], Dominance index (D3) (Kwak & Peterson, 2007) ^[18], Richness index (D) (Margalef, 1951) ^[19], Diversity index (H) Shannon and Weaver (1949) ^[20] and Evenness index (J) (Jaccard, 1908) ^[21] used to evaluate biodiversity of fish in Atshan river.

Results

The levels of dissolved oxygen varied between 9.6 mg/l in winter and 4.9 mg/l in summer, while the pH was recorded in moderate ranges tending to light basal during the different seasons, as it was within the range 7.7 in winter and 1.7 in spring. As for salinity, it varied between 2.5 parts per thousand in the summer and its lowest level in the winter was 2 parts per thousand. As for water temperatures, it varied between 32.5 degrees Celsius in the summer, and its lowest value was recorded in the winter 14.1 Celsius (fig. 2)

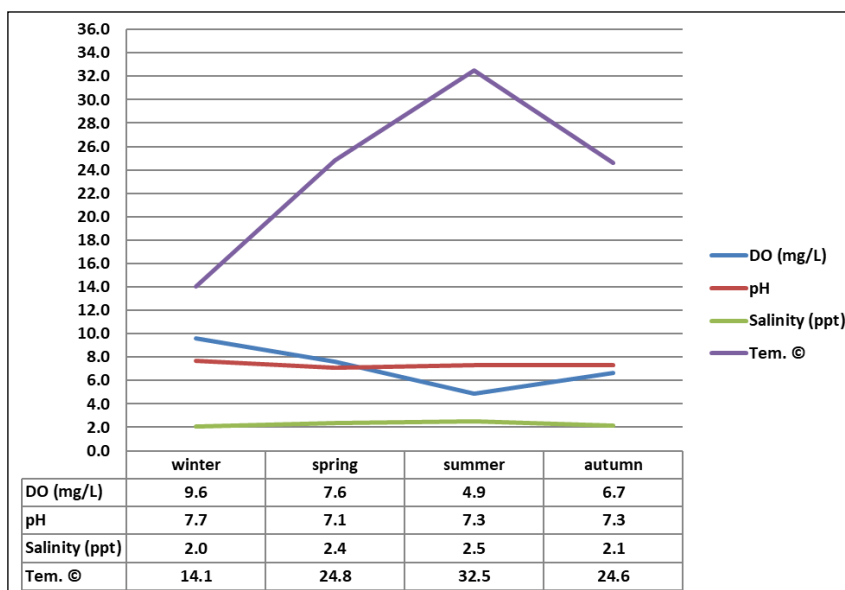


Fig 2: Seasonal variation in some ecological factors of water in Atshan river

Occurrence: its shows that resident group includes four species and the seasonal group includes three species, whereas the rare group includes five species (table 1).

Table 1: Occurrence of species in Atshan river

Groups	Occurance	Species
Resident group	12 – 9	<i>C. auratus</i> ; <i>C. luteus</i> ; <i>O. aureus</i> ; <i>C. zillii</i> ;
Seasonal group	8 – 5	<i>A. sellal</i> ; <i>H. leucisculus</i> ; <i>L. vorax</i> ;
Rare group	4 – 1	<i>P. abu</i> ; <i>C. carpio</i> ; <i>L. xanthopterus</i> ; <i>S. triostegus</i> ; <i>M. mastacembelus</i>

Caught fish

After the sampling period was completed, the number of fish caught was 1055 fish belonging to 12 species (table 2). The following environmental evidence was calculated.

Table 2: Fish numbers according their species and families

	Local name	Scientific name	Family	witer	spring	summer	autumn
1	Himri	<i>Carasobarbus luteus</i>	Cyprinidae	10	122	15	21
2	*Carp brusy	<i>Carassius auratus</i>	Cyprinidae	117	33	12	131
3	*Carp shae'	<i>Cyprinus carpio</i>	Cyprinidae	-	-	-	2
4	Gattan	<i>Luciobarbus xanthopterus</i>	Cyprinidae	-	1	-	-
5	*Redbelly tilapia	<i>Coptodon zillii</i>	Cichlidae	11	9	5	19
6	Blue tilapia*	<i>Oreochromis aureus</i>	Cichlidae	66	164	14	107
7	semnan tuyel	<i>Alburnus sellal</i>	Leuciscidae	35	12	2	67
8	Shillig	<i>Leuciscus vorax</i>	Leuciscidae	3	3	3	3
9	Samenan*	<i>Hemiculter leucisculus</i>	Xenocyprinidae	1	-	2	31
10	Jirri dijlah	<i>Silurus triostegus</i>	Siluridae	2	12	-	-
11	Khishni;	<i>Planiliza abu</i>	Mugilidae	2	-	-	17
12	Marmarij	<i>Mastacembelus mastacembelus</i>	Mastacembelidae	-	1	-	-

* Alien species

Biological indices

Dominance index (D3) value reached 77% for the three most abundant species, *O. aureus*, *C. auratus* and *C. luteus*. Richness index (D) vary between 1.34 in autumn and 1.51 in summer, while Diversity index (H) records highest value in summer 1.68 and lowest in Spring 1.34. Evenness index (J) varied in summer 0.86 and 0.64 in winter.

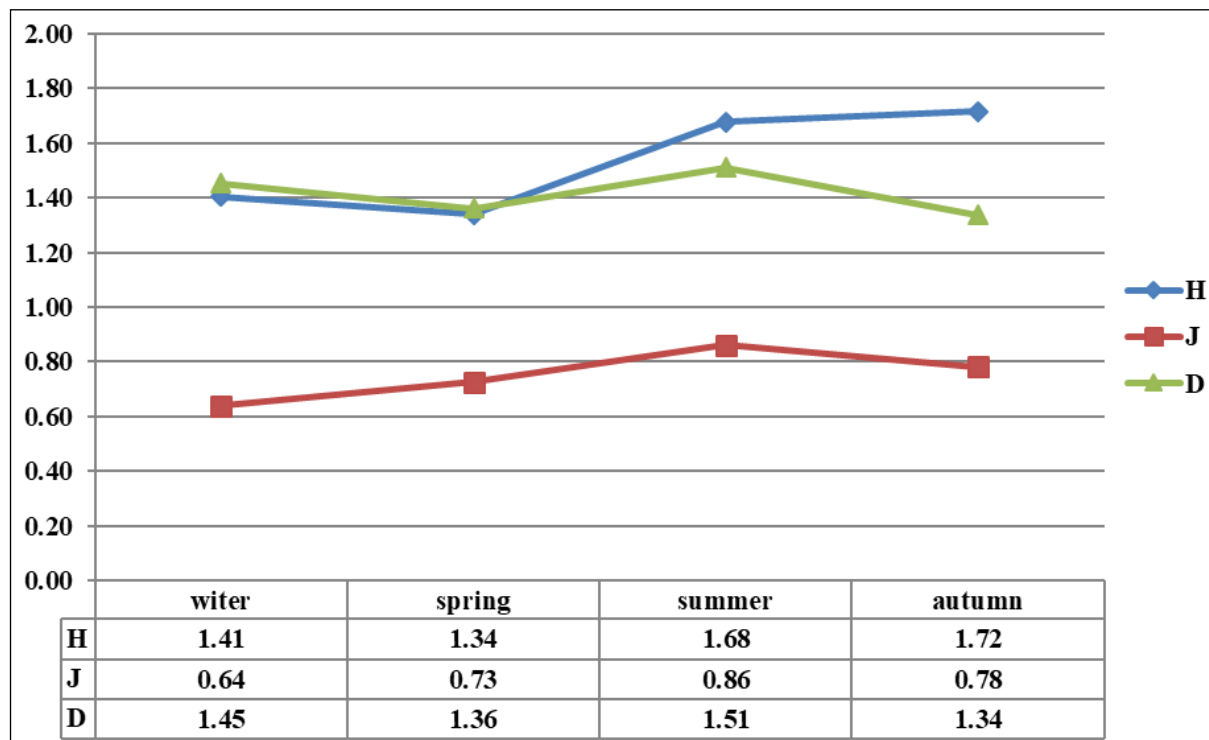


Fig 3: Biological indices in Atshan river near Samawah

CCA in fig.4 showed that the indicators of diversity and equality are positively correlated with water temperature and salinity, and this represents the first group, while the second group showed a correlation of richness evidence with dissolved oxygen and water pH. Axis1 eigenvalue is 77% while it was 23% for axis2, so this cca diagram represent 100% of correlation between variables.

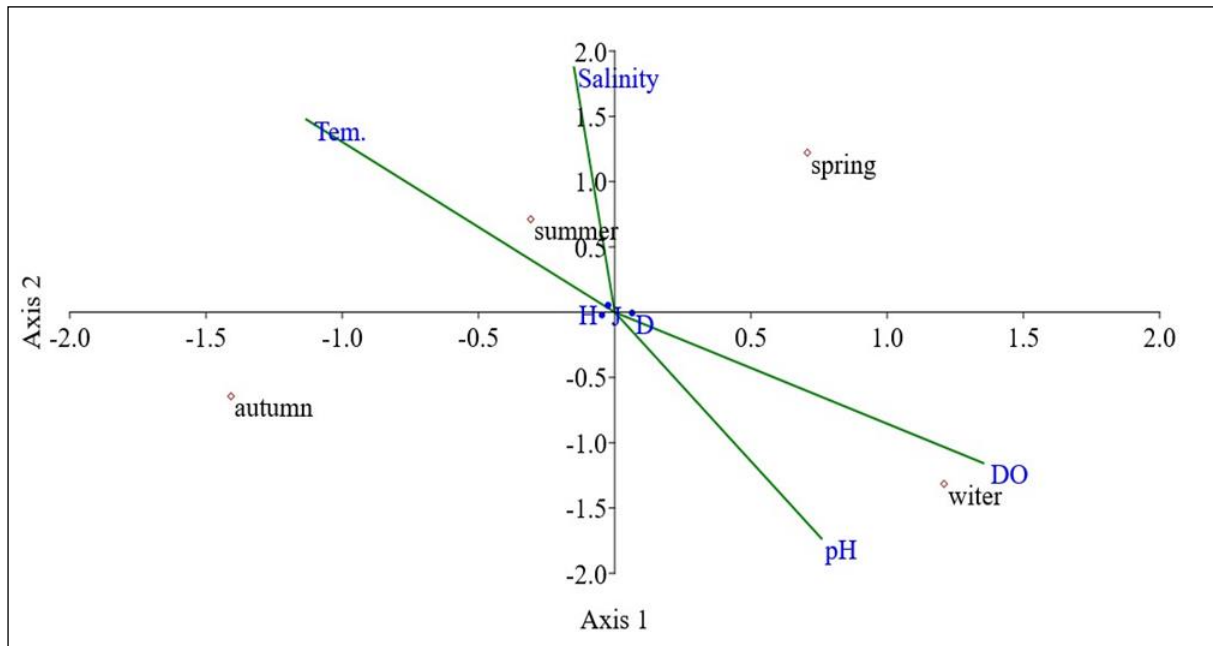


Fig 4: relationship between Biological indices and ecological factors by CCA

Discussion

The number of the four resident species recorded in the current study, three of which are exotic and one of them local, shows the dominance of alien species and their adaptation to the environment of the Atshan river, which negatively affects the sovereignty, presence and abundance of local species. We note that the group of rare species amounting to five, most of them are local fish, which indicates a clear decrease in the number of local fish species, which threatens several species with extinction. This came in somewhat consistent with what Mohamed & Al-Jubouri, (2017) ^[9] stated in his study on the Diwaniyah River and Al-Helli, (2019) ^[11] in his study on the Euphrates River in Samawah, as well as with Ahmed's study on the Al-Kahla River, and he disagreed with Al-Amari, *et al.* (2012) ^[22]. The decrease in the indicators of biodiversity evidence in the current study compared to previous studies conducted on the Euphrates River is due to the decrease in the flow of river water and changes in the physical and chemical factors of the water, the obvious of which is the high salinity recorded, which reached 2.5 parts per thousand, as well as the excessive fishing effort in the area and the use of non-fishing methods Legal, in addition to the abundance of alien species that invaded local fish habitats and competed for food sources, all of these reasons may have directly affected the abundance and diversity of fish, the proportion of species, their distribution and dominance in Atshan river. What reinforces this explanation is the clear dominance of exotic species, which included the blue tilapia and the Prussian carp, and the evidence of the masters was with Hamri, who came third with a rate of 77%, On the other hand, CCA analysis of indicators clarified the relationship between evidence of biodiversity and environmental factors during the seasons of the year.

Conclusion

The dominance of exotic species in the Atshan River, represented by blue tilapia and Prussian carp, and a decrease in the number and abundance of local species, and the absence of some of them in the fishing sample, such as carp and brown, which threatens some species with extinction, as well as a significant decrease in the evidence of the biodiversity of Atshan river fish as recorded in the river An increase in salinity compared to the waters of the Euphrates River in Samawa.

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