



Composition and Ecological Indices of the Fish Assemblage at West Hammer Marsh, Southern Iraq

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Abstract. Monthly composition and ecological indices of fish assemblage at West Hammer marsh were studied during the period from October 2021 to September 2022. Three stations were chosen: Al Manar, Al Fhood and Al Tar. The fish assemblage consists of thirteen native species, seven exotic species and four marine migrants. Cyprinidae was the dominant fish family, consisting of twelve species, followed by family Cichlidae with three species and Gobiidae with two species; the rest of the families formed of one species only. Species were classified according to monthly occurrence according to Tyler (1971) into resident and seasonal groups. The highest number of species was recorded in Al Fhood station (22) and the lowest at Al Tar (16). While the highest and lowest number of individuals recorded in Al Manar and Al Tar were 3417 and 2218 respectively. Exotic species *Carassius gibelio* scored the highest relative abundance in Al Fhood and Al Tar, while in Al Manar station, native species *Planiliza abu* scored the highest relative abundance. In West Hammar marsh, the second rank was exotic species *Carassius gibelio* and the third rank was also exotic *Oreochromis aureus*. The highest and lowest evenness values recorded in Al Fhood station were 0.866 and 0.387 respectively. The highest value of diversity recorded in Al Fhood station was 2.29 in March 2022 and the lowest 1.08 in Al Manar station in January 2022. The highest richness value was 3.39 in September at Al Tar station, however, the lowest recorded in Al Manar station was 1.45 in October.

Keywords. Mesopotamia marshes, West Hammar marsh, Fish ecological indices, Marsh native species, Marsh exotic species, Gulf migratory species.

1. Introduction

2.

Mesopotamia marshlands are a unique ecosystem in middle east and south-western Asia . It characterized by vast area with diverse types of marshes ecosystems and posses rich biodiversity and high productivity. Southern marshes consider as refuge for millions of migrating birds and as spawning and nursery grounds for several marine fishes and shrimp migrating from the Arabian Gulf [1]. Southern marshes were drained (1990-2003) by Saddam regime to about seven percent of their original size, After 2003, the marshes were haphazardly inundated with more than half reclaimed [2].

West Hammer marsh represent the west flank of southern marshes, it received its water from Euphrates river in shape of several tributaries. Actually before 1990 derange it was part of massive Al Hammar marsh, after inundation in 2003 West Hammer marsh was separated from the eastern part by series of small isles and thick plantation of common reeds. the estimated area of the marsh is 148,393 sq. hectors (Ministry of irrigation) .Recently the southern marshes faces several ecological problems mainly decrease in freshwater supply from Euphrates tributaries due to building dams in on Tigris and Euphrates. The aim of the present study the composition of the fish assemblages and ecological indices in west Hammar marsh, No previous published work was trace about the fish composition in West Hammar marsh.

3. Methods and Material

The southern Iraqi marshes covered by thick emerged aquatic plants mainly *Phragmites australis* ,*Typha demoningesis* and *Schinoplactus littoralis* . Three field stations were choose in west Hammar marsh.The first station was the Al Tar represent an openness marsh type with water depth between 0.65 -2 meters. The second was Al Fhood also an openness marsh type with water depth between 60-2,5m .the third station was Al Manar represent mixed of an openness and channel marsh types with water depth

between 40-2m.Several freshwater turtles *Mermyce caspica* and *Raftus euphraticus* trapped in fishing nets .Co- ordination of the three stations were measured by Garmin GPS-126 .

Major water parameters were measured ,water temperatures C^o ,pH and salinity g/l. Fish samples were collected monthly by two methods first fixed gill nets(12 hr. fishing) and second electro fishing (1.5 hr, fishing) .Fish species were classified according [3-6]. Number of individuals for each species were counted in order to calculate the relative abundance [7]. Species were categorized to resident ,seasonal and rare after Tyler [8]. Specie were also divided according to their origin. Diversity indices of Shannon and Weiner [9], Richness index of Marglaf [10] Pilou index [11], statistical analysis program (spss) was applied to verified the significant values of the data [12].

4. Results and Discussion

4.1. Water Parameters

Water temperature were measured monthly in the three allocated stations Fig. (1) ,the lowest temperatures recorded were 17 and 18 C^o in December 2021 and January 2022 ;the highest 33 and 36 were recorded in July and August 2022 .No significant differences existed between the designated stations .Spatial difference did existed between the stations could be due the time lag in measuring temp., water depth and amount of shade play a role in decreasing the water temperature . The lowest salinity recorded at Al Tar ,Al Fhood and Al Mnar 4.51‰,1.12‰ and 1.34‰ in October and February respectively .The highest salinity values recorded again in Al Tar station 8.23 ‰ in August ,Al Tar 3.9‰ in September and 3.93‰ in June in Al Fhood station (fig 2). Increase in salinity values could be related decrease in freshwater discharge from Euphrates river and increase in air temperature due to global warming [13,14], in salinity in Al Tar station could be related to stagnation and very slow current led to increase of evaporation . positive correlation were obtained between number of species and water temperature) $r=0.532$. [15],

postulated the positive effect of water temperature on increase availability of fish species in the study area .Fig (3) exhibited monthly pH values in the three station and ranged between 6.5 -8.5 , the lower pH values was due to decomposition of aquatic plants and biota due to use local

poisons in fishing while increase in pH mainly due to increase in salinity ,never the less these values are in accordance with previously recorded pH values to Iraqi inland waters [16].

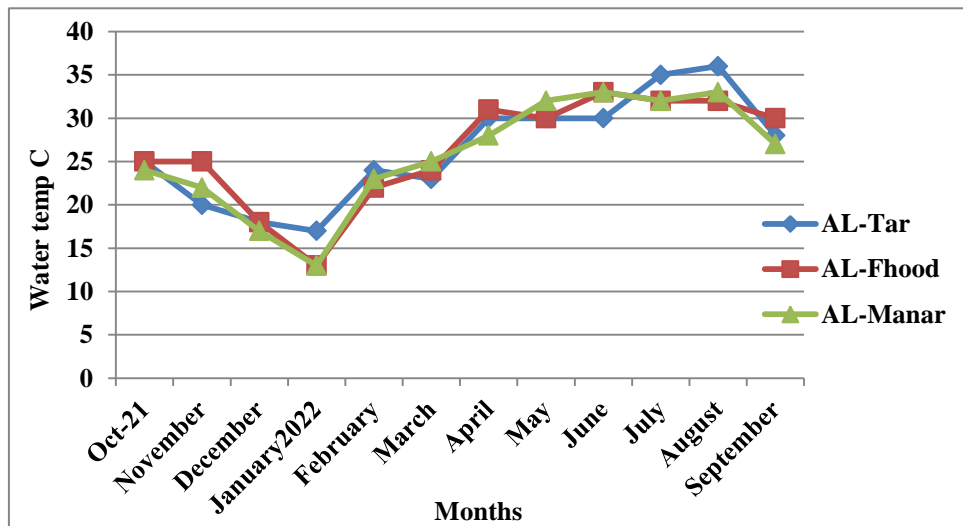


Figure 1. Monthly changes in water temperature C0 in Al Tar ,Al Fhood and Al Manar stations during the period from October 2021 to September 2022 in west Hammar marsh.

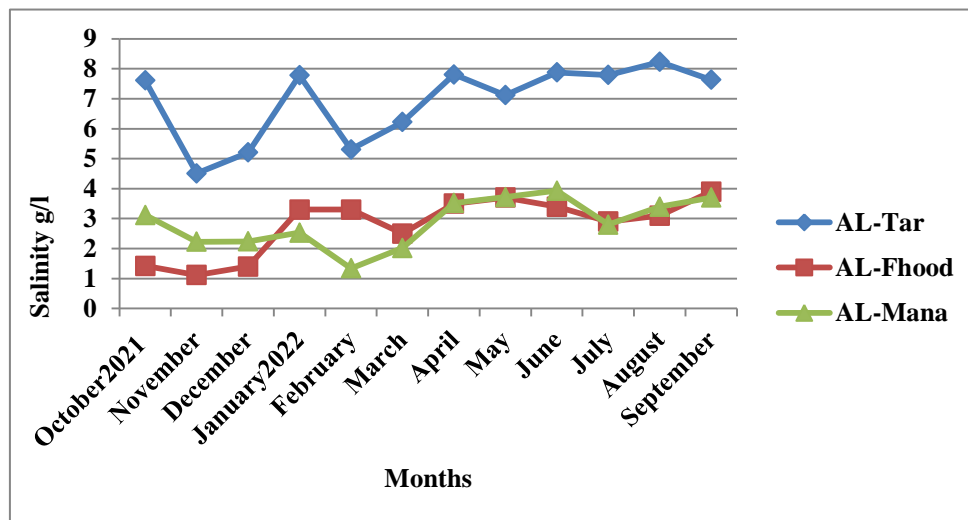


Figure 2. Monthly changes in salinity g/l in Al Tar ,Al Fhood and Al Manar stations during the period from October 2021 to September 2022 in west Hammar marsh.

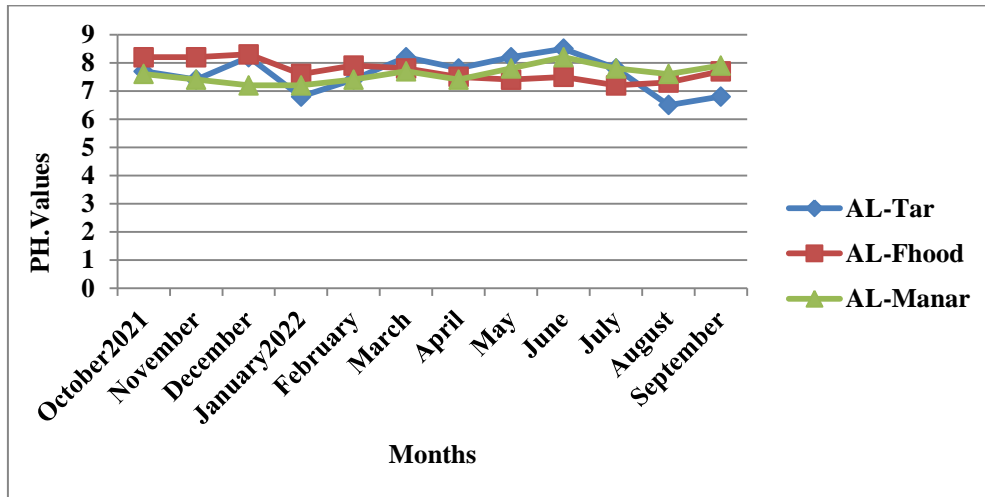


Figure 3. Monthly changes in pH in Al Tar ,Al Fhood and Al Manar stations during the period from October 2021 to September 2022 in west Hammar marsh.

4.2. Composition of the Fish Assemblage

8118 fish were collected from the three stations during the sampling period from October 2021 to September 2022 ,all the fish belong to class Osteichthyes. Family Cyprinidae contributed the highest number of species 12 [17], followed by family Cichlidae comprised of three species then family Gobiidae by two species, other families formed of one species. In total 24 species were obtained during the study period,13 of them were native 54.1% ,Exotic were seven formed 29.1% .Marine migratory were 4 formed 16.6%(table 2). Fig. (5) showed the monthly fluctuations in number of species in the three sampled

stations. Al Fhood was the first in number of species 22, second was Al Tar station 21 species and third Al Manar 16 species. Number of individuals obtained exhibited reserve sequence Al Manar station was the highest 3417 followed by Al Fhood 2483 individuals and at the last Al Tar station 2218 , No stable pattern appeared in monthly number of species ,never the less Al Fhood was the richest in number of species got the highest number in October, November ;December 2021 and January ,March, April and May 2022. Al Tar station in February ,August and September 2022.A l Manar was the poorest only in June 2022 .

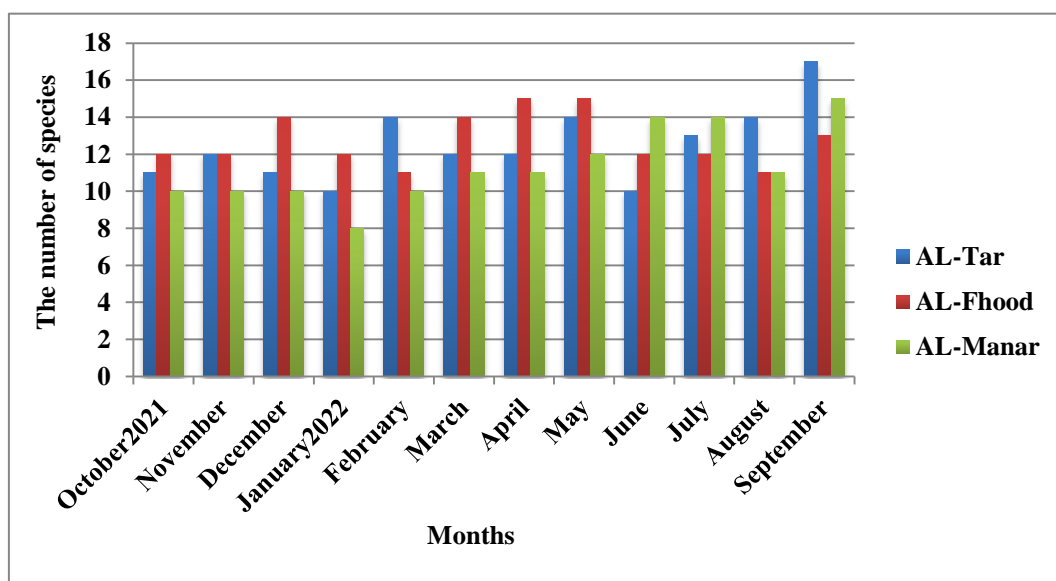


Figure 4. Showed the monthly fluctuations in number of species in the three sampled stations.

4.3. Relative Abundance

Native species *Planiliza abu* scored the highest relative abundance In west Hammar marsh in second rank was exotic species *Carassius gibelio* and third rank also exotic *Oreochromis aureus* . In general the difference between the first and second species was negligible. Table (1) showed the monthly fluctuations in relative abundance of species collected in the three studied stations. *L.abu* In Al Tar station the highest relative abundance was for species *Carassius gibelio* (exotic) and the lowest was *Acanthobrama marmid* (native), In Al Fhood station the highest relative abundance was *Carassius gibelio* (exotic) and the lowest *Poecilia latipinna* (exotic). In Al-Manar station the highest relative abundance was *Planiliza abu* (native) and the lowest *Arabibarbus grypus* (native)

Exotic species scored the highest relative abundance in two stations in Al-Tar and Al Fhood and native species in Al-Manar, indicating the dominance of exotic species on native ones. Previously known that *P.abu* was most dominant species in Iraqi marshes. Native species could suffer from increase of salinity and global warming and competition on food resources and even micro habitat .exotic species were introduced to Iraqi inland mostly for aquaculture purposes other by accident from neighboring countries. The results indicated drastic decrease in number of native species and also number of individuals. Several native become very rare represent by one or two individuals previously were common .like *C. sharpyi* *A.xinthopterus* *A.grypus*.

Table 1. Showed the monthly fluctuations in relative abundance of species collected in the three.

The scientific name	Relative abundance		
	AL-Tar	AL-Fhood	AL-Manar
<i>Planiliza abu</i>	16.7	12.9	34.2
<i>Carassius gibelio</i>	25.2	21.4	15.3
<i>Oreochromis aureus</i>	18.5	18.8	13.9
<i>Oreochromis niloticus</i>	18.6	14.5	13.2
<i>Carasobarbus luteus</i>	1.8	14.1	9.30
<i>Coptodon zillii</i>	5.09	4	4.34
<i>Hemicuiter leucisculus</i>	5	5	3.23
<i>Leuciscus vorax</i>	1.4	1.6	1.86
<i>Silurus triostigus</i>	1.12	2.3	1.50
<i>Mastacembelus Mastacembelus</i>	0.78	1.07	0.99
<i>Cyprinus carpio</i>	1.4	0.94	0.43
<i>Mesopotamichthys sharpyi</i>	0.43	0.07	0.47
<i>Thryssa vitrirostris</i>	0.72	0.56	0.21
<i>Garra rufa</i>	0	0.21	0.098
<i>Mystus pelusius</i>	0	0.24	0.15
<i>Arabus grypus</i>	0	0.12	0.056
<i>Poecilia latipinna</i>	1.3	0.08	0
<i>Acentrogobius dayi</i>	0.2	0.15	0
<i>Heteropneustes fossilis</i>	0.13	0.05	0
<i>Bathygopius fiscus</i>	0.18	0.51	0
<i>Cyprinion kais</i>	0.24	0.10	0
<i>Luciobarbus</i>	0.081	0.13	0
<i>Acanthobrama marmid</i>	0.075	0.12	0
<i>Cyprinion macrostomum</i>	0.18	0	0

Table 2. Classification of fishes collected from West Hammar marsh and their origins, during the period from October 2021 to September 2022.

Scientific name	Genera	family	Origin
<i>Leuciscus vorax</i>	<i>Cypriniformus</i>	Cyprinidae	Native
<i>M. sharpyi</i>	<i>Mesopotamichthys</i>	Cyprinidae	Native
<i>I.xanthopterus</i>	<i>Cyprinidaae</i>	Cyprinidae	Native

<i>C. luteus</i>	<i>Carasobarbus</i>	Cyprinidae	Native
<i>Garra rufa</i>	<i>Cyprinidae</i>	Cyprinidae	Native
<i>Arabibarbus grypus</i>	<i>Cypriniformus</i>	Cyprinidae	Native
<i>C.macrostromum</i>	<i>Cypriniformus</i>	Cyprinidae	Native
<i>Cyprinion kais</i>	<i>Cypriniformus</i>	Cyprinidae	Native
<i>A.mossulensis</i>	<i>Alburns</i>	Cyprinidae	Native
<i>Silurus triostigus</i>	<i>Silurus</i>	Siluridae	Native
<i>M. mastacembelus</i>	<i>Mastacembelus</i>	Mastacembelidae	Native
<i>Planiliza abu</i>	<i>Planiliza</i>	Mugilidae	Native
<i>Mystus pelusius</i>	<i>Silurus</i>	Bagridae	Native
<i>Cyprinus carpio</i>	<i>Cyprinus</i>	Cyprinidae	Exotic
<i>Carassius gibelio</i>	<i>Carassius</i>	Cyprinidae	Exotic
<i>Poecilia latipinna</i>	<i>Poecilia</i>	Poeciliidae	Exotic
<i>H. fossilis</i>	<i>Heteropneustidae</i>	Heteropneustidae	Exotic
<i>Coptodon zillii</i>	<i>Coptodon</i>	Cichlidae	Exotic
<i>O. niloticus</i>	<i>Oreochromis</i>	Cichlidae	Exotic
<i>Oreochromis aureus</i>	<i>Oreochromis</i>	Cichlidae	Exotic
<i>H.leucisculus</i>	<i>Hemiculter</i>	Cyprinidae	Marin
<i>Thryssa vitrirostris</i>	<i>Thryssa</i>	Engraulidae	Marin
<i>Bathygopius fiscus</i>	<i>Bathygopius</i>	Gobiidae	Marin
<i>Acentrogobius dayi</i>	<i>Bathygopius</i>	Gobiidae	Marin

4.4. Yearly Occurrence

Monthly Species occurrence were categorized according to Tyler (1971) to three major groups to:

4.4.1. Resident Species

Formed of eleven species, these species occurred from 11 -12 months and formed 54.1% (Planiliza abu, Oreochromis niloticus, Carassius gibelio, Oreochromis aureus, Coptodon zillii, Leuciscus vorax, Silurus triostigus, Hemiculter leucisculus, Cyprinus carpio, C.luteus, M. Mastacembelus).

4.4.2. Seasonal Group

Table 3. Monthly occurrence of fish species categorized according Tyler (1971) to from west Hammar marsh during the period from October 2021 to September 2022.

Group	Occurrence	Species
Resident	11-12 month	<i>P.abu, O.aureus, O.niloticu</i>
		<i>C.gibelio, C.zillii, C.luteus</i>
Seasonal	5-6 month	<i>H.leucisculus, L.vorax, C.carpio</i>
		<i>M.mastacembelus, S.triostigus</i>
		<i>M.pelusius, M.sharpyi, B.fiscus</i>
Rare	1-2 month	<i>A.dayi, P.latipinna, G.rufa,</i>
		<i>T.vitrirostris</i>
		<i>A.marmid, H.fossilis, C.kais</i>
		<i>I.xinothoptrus A.grypus,</i>
		<i>C.macrostromum</i>

4.5. Ecological Indices

Comprised of seven species occurred 6-5 months and formed 29,1% from total number of species (*Poecilia latipinna*, *Mesopotamichthys sharpyi*, *Acentrogobius dayi*, *Mystus pelusius*, *Garra rufa*, *Bathygopius fiscus*, *Thryssa vitrirostris*).

4.4.3. Rare Group

Consisted of eight species occurred 1-2 months and formed 25% of the total number of species (*Luciobarbus xanthopterus*, *Cyprinion kais*, *Cyprinion macrostromum*, *Heteropneustes fossilis*, *Arabibarbus grypus*, *Acanthobrama marmid*).

Diversity indices In general west Hammar exhibited low to moderated values of

diversity mainly due to low number of species and individuals. The highest value of diversity recorded in Al Fhood station 2.29 in March 2022 and the lowest 1.08 in Al Manar station in January 2022. Diversity values showed the same pattern and even similar values in the three

stations during the period from April to September 2022. However the first half of the year exhibited large fluctuations between the stations values. Al Fhood recorded values better than the other two Al Manar and Al Tar stations during the first months of sampling period.

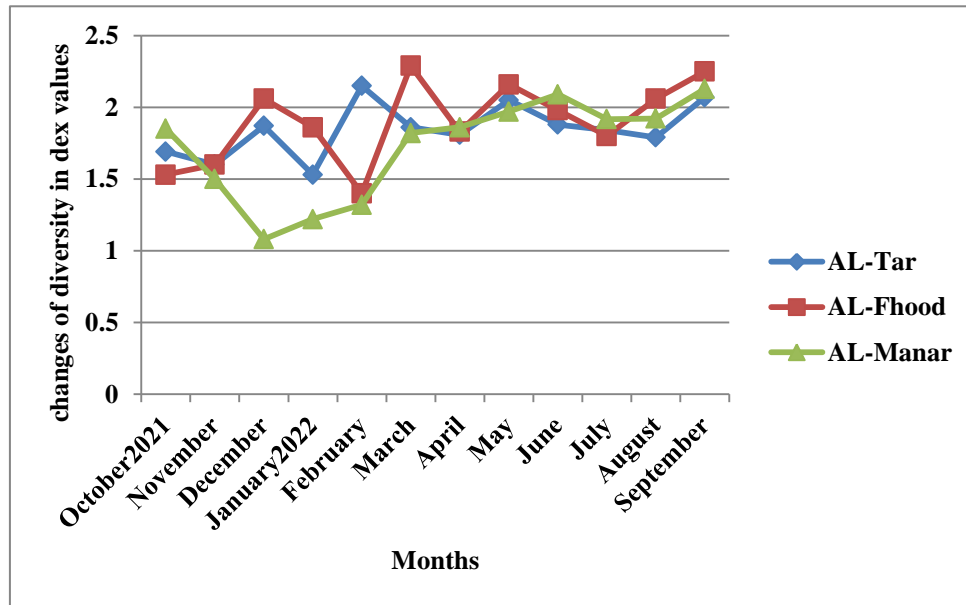


Figure 5. Monthly changes of diversity index values at AL-Tar, AL-Fhood and AL-Manar stations from October 2021 to September 2022.

In general evenness values in west Hammar marsh moderately diverted from 0.5 value for balanced assemblage. Evenness values for three stations indicated status of moderate dominoes of certain species in the assemblage and status of not evenly distributed of individuals on species. Al Manar was the best station showed only cases below 0.5

in December 2021 and July 2022 in case of Al Fhood station showed two cases below 0.5 in October 2021 and April 2022. The worst station was Al Tar with five cases below limit in October 2021, April, July, August and September 2022. The highest and lowest evenness value recorded in Al Fhood station 0.866 and 0.387 respectively.

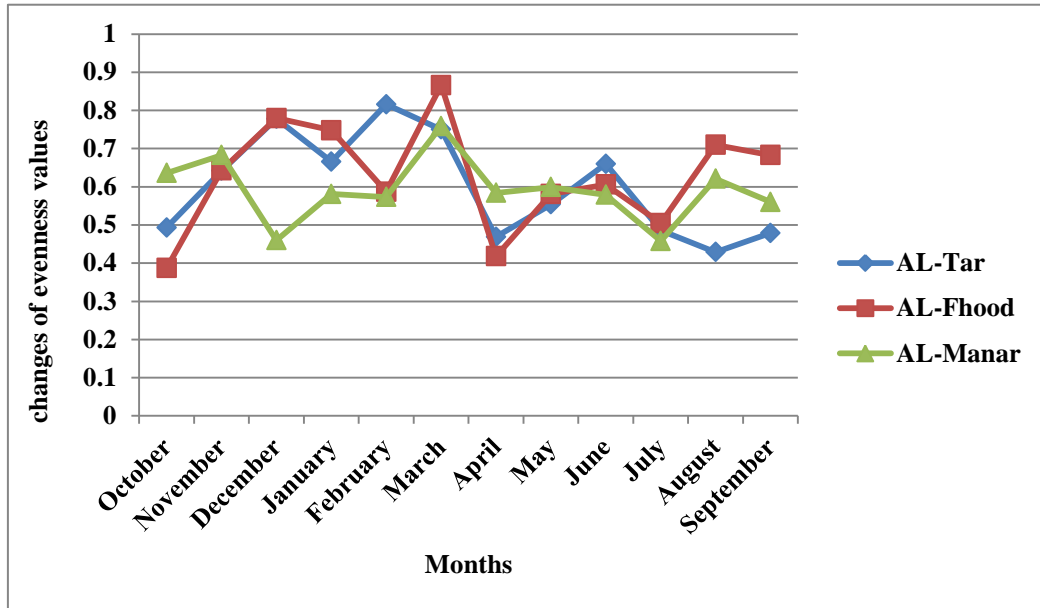


Figure 6. Monthly changes of evenness index values at AL-Tar,AL-Fhood and AL-Manar stations from October 2021 to September 2022.

In September the highest Marglaf richness values in all three stations ,however Al Tar scored the highest values followed by al Fhood and on third rank was Al Manar station. During Autumn and winter al-Fhood scored highest values followed by al Manar expect in February .AlFhood station two richness decline values the largest in February and in July. In general the three stations showed the same trend of

flacuations from dctober 2021 to January 2022 and than from March to September 2022 .february consjder as spawning season for native species and migrate toshallow areas like Al Manar station . The highest richness value 3.39 in September at Al Tar station however the lowest recorded in Al Manar station 1.45 in October.

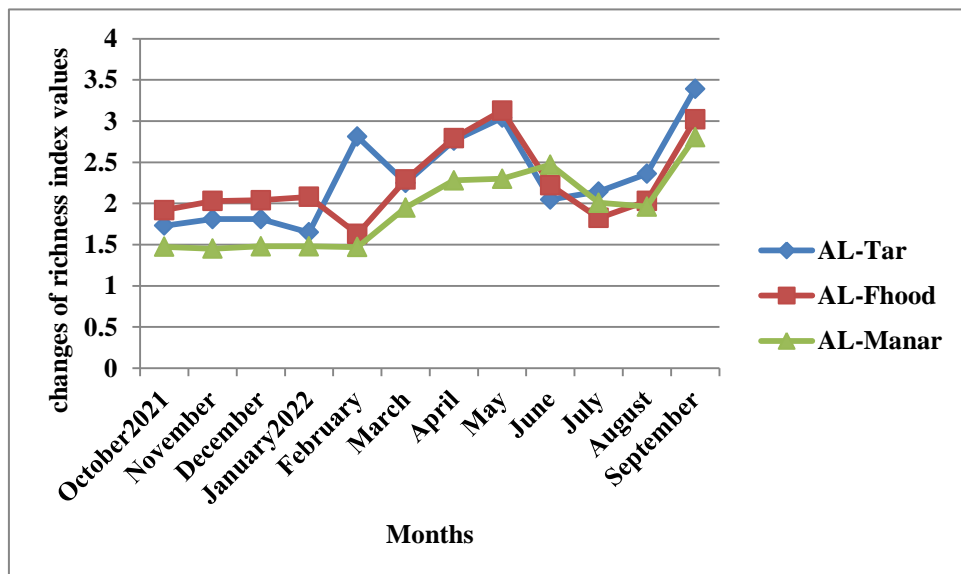


Figure 7. Monthly changes of richness index values at Al-Tar, Al-Fhood and Al-Manar stations from October 2021 to September 2022.

Conclusion

The highest value of diversity recorded in Al Fhood station 2.29 in March 2022 and

the iowest 1.08 in Al Manar station in January 2022 The highest richness value 3.39 in September at Al Tar station

however the lowest recorded in Al Manar station 1.45 in October.

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