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## study fish assemblages of Intertidal flats in Iraqi marine water

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## study fish assemblages of Intertidal flats in Iraqi marine water

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**Abstract.** The seasonal study of tidal fish assemblages in Iraqi marine waters, which lasted from January 2016 to December 2016, selected three stations for the first station name Fao Head and the second station Al-Gamouri and the third station for the Western waves Breaker, recorded the highest temperature in the second station and reached to 27c.

While the highest salinity concentration was recorded at the second station at 43ppt, a total of 2221 fish have collected 40 species belonging to 28 families and 8 orders were recorded in three study stations and the highest number of species reached to 35 species in the second and third stations in autumn. The *Photopectoralis bindus* species dominate the highest number of individuals in autumn season reached to 284 fish in the second station, the maximum number of species reached to 33 species in summer at all the three stations. From the multivariate analysis, it was observed that the number of species was significantly correlated with some ecological factor with a total number of species and individuals.

**Keywords:** Fish assemblages, Iraqi marine water, seasonal, fish

### 1. Introduction:

Iraqi coastal waters occupy the northwestern section of the Arabian Gulf, which represents the estuarine portion of the Gulf Iraq, on the gulf, has a small coastal region separating Iran and the Arabian Peninsula, Given the limited length of the Iraqi coastline of 105 km and the continental shelf of 1034 km<sup>2</sup>, and its territorial waters of 716 km<sup>2</sup>.

Estuaries are places where fresh and marine water meet and mix. [1], That is why they represent the connection between the sea and the land. Due to the supplement of nutrients carried by rivers, they are known as among the most productive environments on earth but also rank among the environments most affected by humans through river pollution and activities [2]. Recently, the discovery in Iraq's turbid coastal waters of a unique 28 km<sup>2</sup> coral reef

This area will stimulate the interest of government agencies, environmental organizations, and the international scientific community working on a fundamental understanding of coral marine ecosystems and today's global climate [3]. This is an important area used by many fish species as feeding and nursery land at high tide, and the ecology of the aquatic environment will provide information to understand the nature of energy transferred and available [4]. The total length of the Iraqi coast is 64Kg [5] and [6].

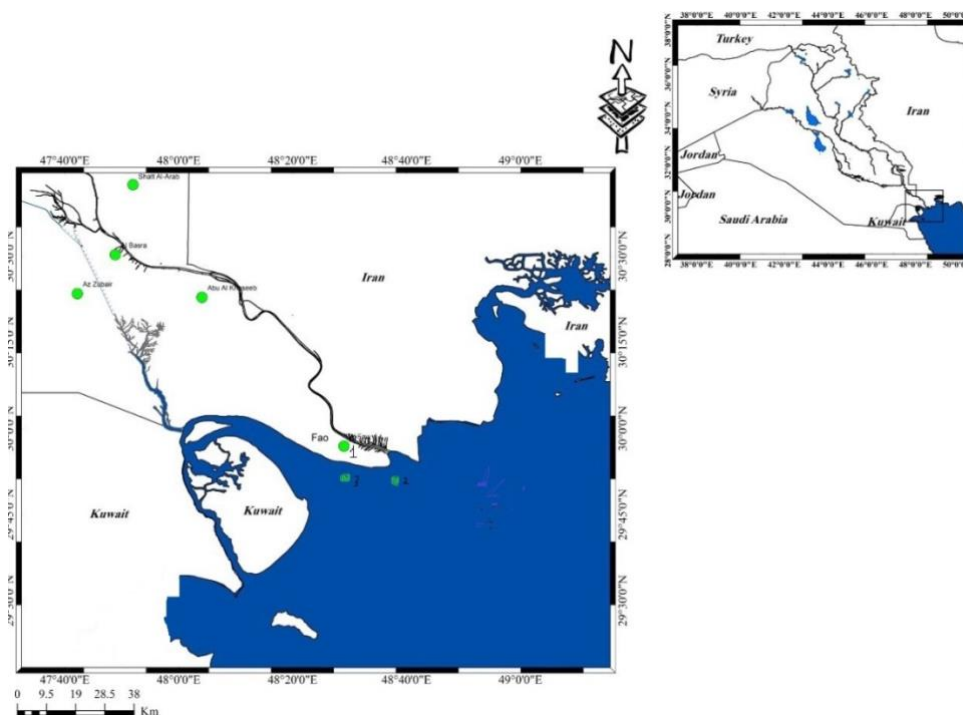
The northern part of the Arabian Gulf was characterized by extensive mudflats, and This is an important area which was used by many species of fishes as feeding and nursery ground at high tide [7]. The aim of the study is to know the fish assemblages in Intertidal flats seasonally in Iraqi marine waters.

### 2. Material and Methods

#### 2.1. Study area:

The study area represents the most environment we choose three study stations, The distance between one station and another station is 15-20 km<sup>2</sup> Fao head cordenater 29°54'15.93"N; 48°41'15.62"E ,Al-Gamouri "29" 48'24N ;48'47'14 E, and third 29°43'33.41"N; 48°43'43.46"E station the Western Breaker of waves Figure 1.





**Figure 1:** Represents the location of the study stations in the Iraqi marine waters during the sampling

### 2.2. Ecological factors:

Physical properties data were recorded in water temperatures were recorded using a simple mercury thermometer of a scale range 0-50 ° C. and Tri-meter field apparatus of Kalbuneh company was used to determine pH in the site. The salinity concentrations were measured using a salinity measuring device manufactured by Senso-Direct 150 a German Lovibone company and the result is expressed in parts per thousand (ppt). To measure dissolved oxygen, the Winkler method described by the American Health Association was followed [8] and the result is expressed (mg/l).

### 2.3. Fish Collection:

Fish were collected from three study station as a part of the general fish survey of the region by using fishing-survey boats Anwar 2 (16 m length, 4.5 m wide, and 2m draft ) has a horsepower of 150 horses, Each boat supplemented by trawl net of mesh (5\*5) cm and at the bag mesh (3\*3) cm, the length of the net pull rope ranges between 75-100 m The time of pulling the net into three hours Classification of fish according to [9],[10],[11].

### 2.4. Data Analyses:

To calculate the biodiversity indices of the faunal community, a unilabiate analysis was applied using the past 3 program. Several diversity indices were calculated from the abundance in fauna raw data represented by a sum of triplicates for each species at each station imported from Microsoft Excel into past 3 program work following indices were calculated:

- Number of species (S): Total number of species in each replicate sample.
- Number of individuals (N): Total number of individuals in each replicate sample.
- Richness index(D):Margalef's index [12].

$$D = S - 1 / \ln N$$

- Diversity index (H):Shannon-Weaver formula [13].

$$H = -[\sum (pi \ln pi)]$$

Where pi is the proportion of individuals found in each species, takes into account the number of species (S) and the number of individuals(N).

•Evenness index (J):pielou index [14].

$$J=H/Lns$$

$$H=Diversity$$

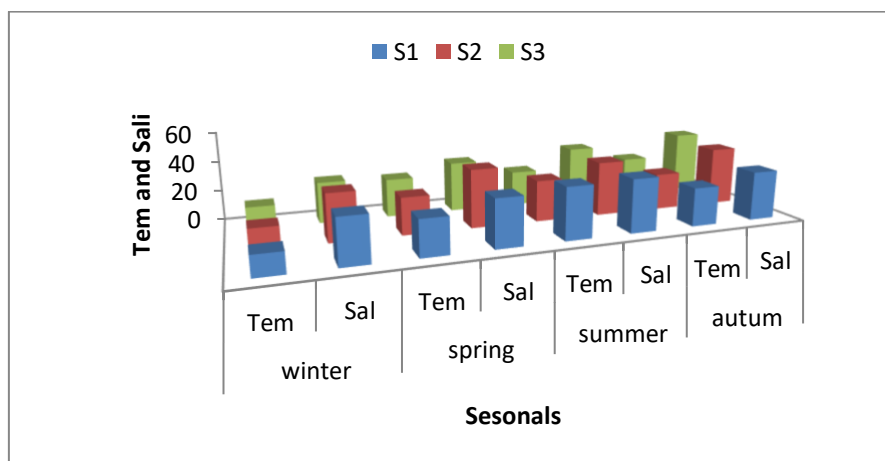
•Dominion Index (D3):According to the sovereign evidence of the equation developed Kwak and Peterson [15] as follows:

$$D3 = [\sum_{i=1}^n pi] * 100.$$

### 3. Result and Discussion

#### 3.1. Ecological factors.

The minimum water temperature value was recorded during Winter reached 13.5°c in the first station, While the Maximum recorded value was 35°c during Summer in the first station. and the results of the present study showed the seasonally changes in salinity concentration among the selected study station, the highest salinity concentration was recorded during autumn and reaching 43 ppt in the third station in tide and lowest in winter and reached 27.8 ppt in third station fig.(2). The structure of the community of any ecosystem varies according to the impact of the physical, chemical, and biological factors variations [16]. The Iraqi marine waters are considered as a nursery and breeding ground for many marines and estuarine fish species due to their high productivity as a result of nutrient-loaded freshwater. from Shatt al-Arab [17]. The temperature readings and trend agreed with the previous studies in the same area. Water temperature didn't show a time lag responding to air temperature which disagrees with that mentioned by [18] due to shallow waters, they found that there is a simple linear relationship between daily and weekly air and water.

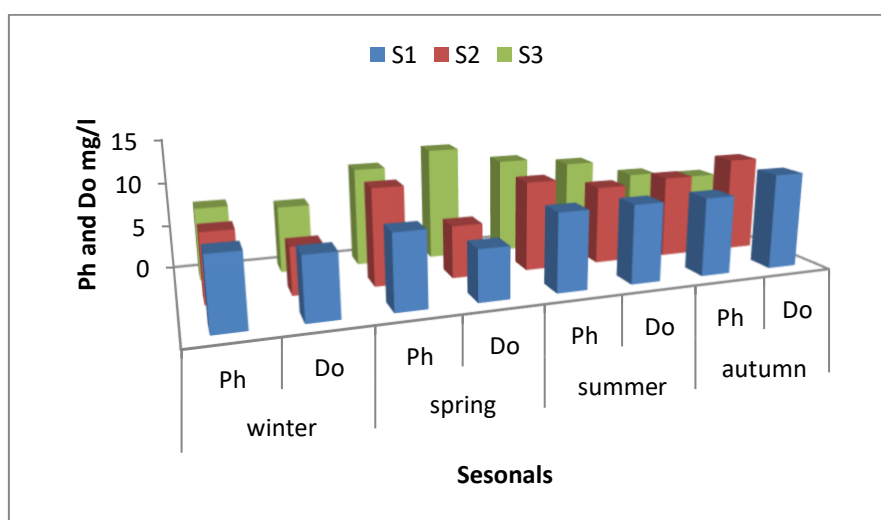


**Figure 2:** Seasonally changes of temperature (°C) and Salinity (ppt) in the three studied stations.

U.S. sea temperature fluctuations. Such interactions range from one stream to another according to water depth. One of the highly volatile environmental variables affecting environmental factors is temperature[19].

Over the last few decades, the sea level has risen due to climate change and the discharge of rivers has decreased due to human impact.

In most estuaries, these two reasons have resulted in increased salinity.[20] The resulting higher salinity or water saltiness could harm plants and animals.[21].The minimum salinity concentration in Western Breaker of waves was 27.8 ppt which is considered to be of high salinity as a result of the two mentioned reasons. this study was agreed with Ali, *et al* [22], in the increase in salinity in Khor Abdullah with 29 ppt during their study in Iraqi marine waters. And agree with Al-Shamary, *et al*,[23]During their studies in Iraqi marine water. as well It reached the highest pH value at the plant The third reached 11.3 during spring, and the minimum value 7.8 during winter in the second station, while the maximum Dissolved Oxygen concentration was recorded during Spring 13 mg/l in the third station and minimum values detected during winter 5.4 mg/l (Figure 3). it may be due to the same previous reason, as it consumes carbon dioxide This led to a slight increase in the pH values as the water base was affected indirectly, The present results are consistent with the base nature of the Iraqi marine waters [24], the productivity of the water body, The causes of low pH in the first and second of living organisms while their decline in the second leg during winter goes back to and increases the activity of living organisms Trimborn from breaking down organic matter and this was confirmed by the Co<sub>2</sub> microspheres that produce and form gas 2 also “the results of the present study agreed with other studies in different regions of the Gulf, including During their studies in the waters of the Kuwaiti coast, they registered [25]. Dissolved oxygen is one of the important environmental factors that affect the abundance of living organisms, in particular, Dissolved oxygen is one of the important environmental factors that affect the abundance of living organisms, in particular Showed [26], And their increased activity in the water column in which they live.



**Figure 3:** Seasonally changes of Ph and Do (mg/l) in the three studied stations.

During their study on the Kuwaiti coast[27], which is the same as found and agreed with AlShamary *et al*, [23] which study on Iraqi marine waters, Lind explained [28] that the melting of gases is proportional to the lower one, the results of the present study showed an increase in the oxygen concentration values in the three study stations to reach the highest in spring 13 mg/l at the third station. A total of 2221 fish from 40 species belonging to 28 families were collected and 8 orders were recorded in three study stations (Table 1), 12 species representing Chondrichthyes (4 sharks and 8 rays) (Table,2).

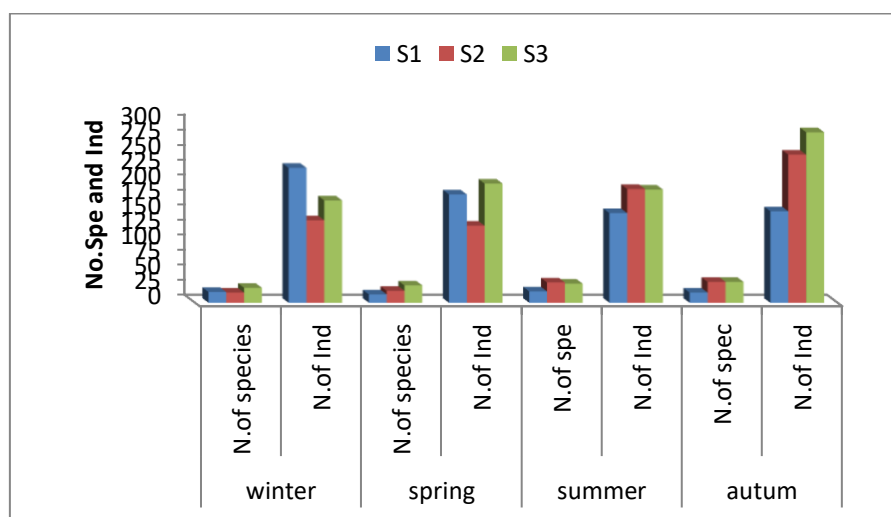
**Table 1:** lists the Families, species, and order of Ooctychthyes fish catch in the three studied stations

Species	Family	Order
<i>Nematalosa nasus</i>	Clupeidae	Anguilliformes
<i>Sardinella albella</i>		
<i>Tenuialosa ilisha</i>		
<i>Thryssa dussumieri</i>	Engraulidae	
<i>Thryssa whiteheadi</i>		
<i>Chirocentrus dorab</i>	Chirocentridae	
<i>Ilisha compressa</i>	Pristigasteridae	
<i>Ilisha melastoma</i>		
<i>Netuma thalassina</i>	Ariidae	
<i>Plotosus lineatus</i>	Plotosidae	
<i>Alepes djedaba</i>	Carangidae	
<i>Scomberoides commersonianus</i>		
<i>Scatophagus argus</i>	Scatophagidae	
<i>Drepana longimana</i>	Drepaneidae	
<i>Ephippus orbis</i>	Ephippidae	
<i>Otolithes ruber</i>	Sciaenidae	
<i>Johnius belangerii</i>		
<i>Johnius dussemeri</i>		
<i>Acanthopagrus arabicus</i>	Sparidae	
<i>Acanthopagrus berda</i>		
<i>Acanthopagrus bifasciatus</i>		
<i>Baleophthalmus dussumierii</i>	Gobiidae	
<i>Trypauchen vagina</i>		
<i>Sillago sihama</i>	Sillaginidae	
<i>Upeneus doriae</i>	Mullidae	
<i>Upeneus</i>		
<i>Apogonichthyoides taeniatus</i>	Apogonidae	
<i>Polydactylus sextarius</i>	Polynemidae	
<i>Pampus argenteus</i>	Stromateidae	
<i>Photopectoralis bindus</i>	Leiognathidae	
<i>Epinephelus coioides</i>	Serranidae	
<i>Trichiurus lepturus</i>	Trichiuridae	
<i>Planliza subviridus</i>	Mugilidae	Mugiliformes
<i>PlanLiza klunzingerii</i>		
<i>Brachirus orientalis</i>	Soleidae	Pleuronectiformes
<i>Cynoglossus arel</i>	Cynoglossidae	
<i>Saurida tumbil</i>	Synodontidae	Aulopiformes
<i>Rhynchorhamphus georgii</i>	Hemiramphidae	Beloniformes
<i>Platycephalus indicus</i>		
<i>Pseudosynanceia melanostigma</i>	Platycephalidae	Scorpaeniformes
<i>Paramonacanthus Choirocephalus</i>	Monacanthidae	Tetraodontiformes

**Table 2:** lists the Families, species, and order of Chonderchthyes fish catch in the three studied stations.

Species	Families	Order
<i>Carcharhinus leucas</i>	Carcharhinidae	Carcharhiniformes
<i>Rhizoprionodon acutus</i>		
<i>Sphyrna mokarran</i>	Sphyrnidae	
<i>Chiloscyllium arabicum</i>	Hemiscylliidae	Orectolobiformes
<i>Aetobatus flagellum</i>	Myliobatidae	Myliobatiformes
<i>Brevitrygon walga</i>	Dasyatidae	
<i>Brevitrygon imbricate</i>		
<i>Maculabatis gerradi</i>		
<i>Pastinachus sephen</i>		
<i>Himantura uarnak</i>		
<i>Gymnura poecilura</i>	Gymnuridae	
<i>Glacostegus granulatus</i>	Glaucostrigidae	Rhinopristiformes

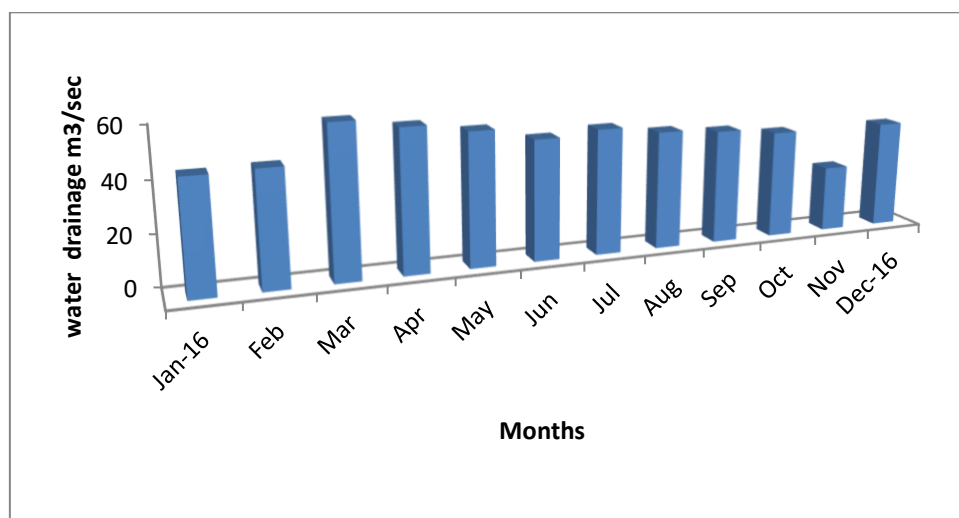
In autumn, the highest appearance of the species at the second and third stations was 35 species, while in spring, the lowest appearance of the species reached 14 species at the first station. While the maximum number of individuals in the third station in autumn reached 284 fish and the minimum number of individuals in the station reached 129 fish in spring, two Figuresigs reached 284 fish , The number of species in the present study reached 14 in spring and, when compared to the above mentioned studies, it was found that there was a decrease in the number of species compared to the studies. The previous reason can be attributed to overfishing operations, represented by an increase in the number of fishing vessels and by the multiplicity of fishing vessels. While Hussain *et al.*[20] and Hussain and Namma[29] recorded 13 species in their Khor Al-Zubair lagoon study, they agreed.



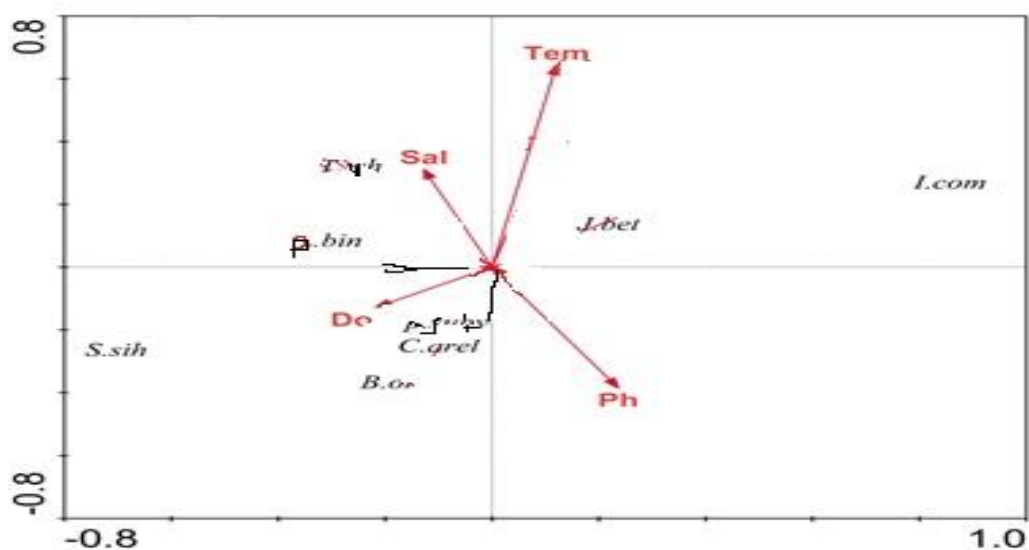
**Figure 4:** Seasonally changes in the number of species and individuals in the three studied stations.

Explain in the present study that fish assemblages have an impact on changes in the environment as a result of different ecological factors from high and low temperatures and salinity as a result of the change in the discharge of Shatt alArab and the lack of expenditure on marine water and dam construction in Turkey and Iran. Figure (5) shows the low water levels entering the Province of Basra by measurement and at a distance of more than 30 km from the meeting point[30].

It is noted that the releases of water reached 60 m<sup>3</sup> / s in March, and this month is considered to be one of the autumn months, and the releases of water from the Tigris River to Basra Province are pushing the salty side towards the marine waters. 33ppt in the first station and closest to marine water were reached in the present study and increased water releases increased the number of species and individuals as the highest number of species reached 35 species in the second and third stations, and this is agree with the study of Al-Shamary *et al.*,[31] and Al-Shamary *et al.* [23].and Summer, Winter, Spring. The most dominant species in the grouping were correlated with environmental factors upon conducting a canonical analysis, as the two species The temperature was correlated with *J.Belangerii*, *I compressa*, and salinity was correlated with *T.vagna*, *P.bindus*, and dissolved oxygen was correlated with *P.subviridus*, *B.orientalus* (Figure 6).



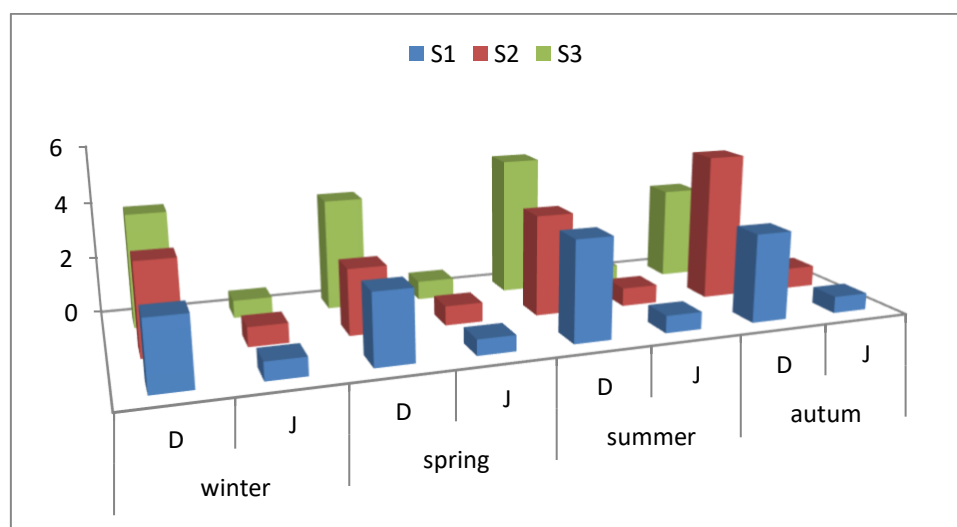
**Figure 5:** Monthly changes of water releases towards Basra city (Water Resources Department in Basra city 2016)



**Figure 6** explain dominants species and correlating with ecological factors



The fluctuation in the values of the indices of diversity and differences reflects the state of exploitation of the downstream by the fish On a seasonal basis, low values reflect the prevalence of a few species, especially in the cold months makes the index very sensitive to any small change, whether numerically or weighed [32]. the maximum with Richness Index and Evenness Index in autumn seasonal in the second station was reached (5.26,0.76) respectively (Figure 7).The Maximum values of the index of equivalence in the autumn months are in the present study and the reasons for the increase may be due to environmental factors, including low temperature and low water releases decrease of Shatt Al arab river discharch [33].stated that parity represents the ratio between true diversity and the maximum possible diversity of species in theory. The evidence evenness index in the present study



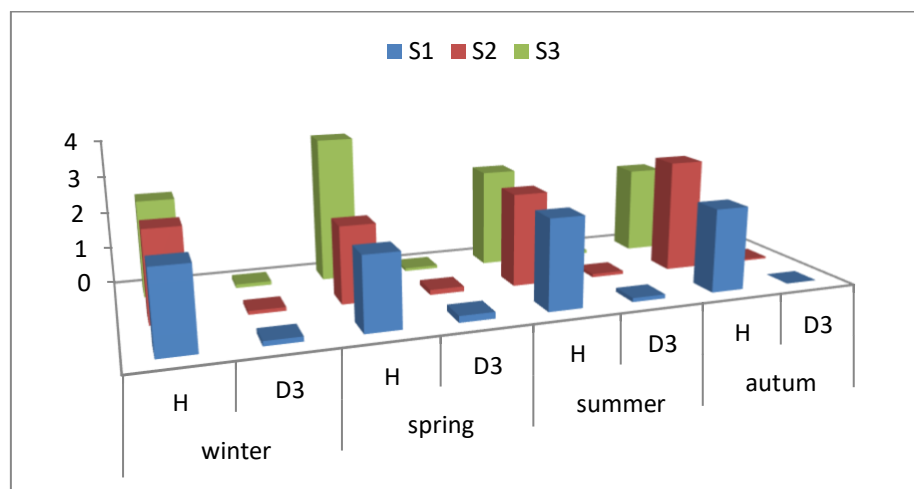
**Figure 7** illustrate the Evenness Index (J) value and Richness Index(D) value

showed a “positive” correlation with the number of species and a negative correlation with the number of individuals, and this is the same as it was precovded by Younius, [34].obtained during his study of fish assemblages north of Khor Abdullah and [35] as the autumn months have a higher evenness index than the remaining months and caused by the reasons to the great fluctuation in some environmental factors that affected the spread of species.

In addition to the values of the diversity index in the present study, the values of the diversity index in the three stations ranged from 2 to 3.96 as specified by Wilhm,[36] the increase in the index values of diversity is due to the overall number of species more than by weight, the values of diversity evidence in the present study are close to many previous studies because they are the same in a relatively wide range, reflecting the use of the species.[37] As the highest value of the index is in the spring and 3.96 in the third station is reached Increasing the number of species and individuals and providing a high dissolved oxygen content in the third station and increasing the release of water during this season.

As the values of the diversity index decrease in winter and the reasons for the decrease are evidence of diversity to the migration factor controlled by biological and environmental conditions, the quaa plays a major role in changing [38].

And many researchers have confirmed that fish assemblages are predominant with a small number of species in the coastal and estuarine regions[39] and therefore less predominant in the current study with the agreement of Younis and AlShamary[40]. In their studies on fish assemblages in Khor Al-Zubair. (see Figure 8).



**Figure 8:** illustrate the Diversity Index (D) value and Dominants Index(D<sup>3</sup>) value

#### 4. Recommendation

The present study recommends that the increase in water releases from the source leads to an increase in biodiversity in the Iraqi marine waters, pushing the salt tongue to the sea, and thus increasing the number of species and individuals for the sustainability of consumer life and the availability of many diversity of fish in Intertidal flats zone.

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