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Abundance, occurrence, seasonal changes and species composition of Macroinvertebrates in the restored Iraqi southern marshes

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Abstract

78 species of macroinvertebrate were recorded in all monitored marshes comprised 17 snails, 40 insects, 4 of each shrimp and Annelid, 3 of each mussel, spider and crab, 2 Isopods, and 1 of amphipod and 1 Cirriped. Density of macroinvertebrates was higher on aquatic plants in all groups except stations Saddah, Burkah (both in East Hammar). the bottom substratum organisms were higher. Maximum species were recorded in Suq Shuyukh 52 species while minimum values were recorded in East Hammar 39 species.

Maximum density was recorded in East Hammar for snail 11.32-15.6 ind. /m^2 on plant and 29.3-27ind/m^2 on bottom substrate, while minimum density recorded in Um Alnaaj (Huwayzah) 2.2 ind. /m2. Maximum value for insect in Burkah bottom 6.3ind/m^2 and minimum value in Suq Shuyukh bottom 0.33 ind. /m^2. Maximum value for shrimp was recorded on plant of Um Alnaaj 15.17 ind. /m2 and minimum value on plant in Amia 6.9 ind. /m^2. Seasonal changes in macroinvertebrates numbers were recognized ,that maximum numbers were recorded for all groups in spring, while minimum values were recorded in summer.

Snail had higher values of diversity in all marshes; moreover East Hammar was higher than that in other marshes in biological indices. Evenness was found to be 0.71 for shrimp in Huwayzah in comparison to Suq Shuyukh 0.45 and East Hammar 0.13. Higher diversity of shrimp in Suq Shuyukh 0.73, while insect had a comparable in seasonal values and low in all ecological indices between Huwayzah and Suq Shuyukh..

1-Introduction

The Mesopotamian marshlands known for centuries as the richest environment in middle east, almost completely disappeared, with only 10 percent of the important ecosystem still remaining, according (UNEP2002), the marshlands previously totaled an area of 15,000 to 20,000 square kilometers (5,800 to 7,700 square miles) but now cover less than 1,500 to 2,000 square kilometers (580 to 770 square miles).

Iraqi literatures on Macroinvertebrates in marshes region were very rare, Old studies about aquatic invertebrates were that of Gurney (1921), Purser *et al* (1981) and Al-Azzawi (1986). Sultan (1992) summarized previous studies and that established on neighboring habitats as Shatt Al-Arab River. Recently Ali and Aziz (2004) and Aziz and Ali (2005) were recorded 59 and 40 species in southern Iraqi marshes respectively, included at least ten species may consider as new record in Iraq.

2-Materials and Methods

Field procedure

Three major methods were used for collecting macroinvertebrates samples (with aquatic plants and with bottom sediments). Small conical hand net (mesh size 1mm), mouth diameter 220mm,wooden quadrate method of side length 25cm(area 625cm^2)was used for collecting both organisms in two habitats Mussels while gastropods, were collected by wooden quadrate three to four times and mean was taken, quadrate was pressed inside clay in depth 12cm. Forceps collected organisms on surface, while Ekman dredge (30x15x15) cm used for many times in each station to combine used substrate organisms, The current flow organisms collected by zooplankton net (Lind, 1979).

Laboratory procedure

In laboratory plants washed by current water to removed organisms, that preservation in ethanol 70% or formaldehyde 4% (Chu, 1949; Ali, 1979, 1989). Clay materials laid in aquarium (30x20x10) cm contain two liter of river water and a little of clay, and separated by washing them with plenty of water over sieve (mesh size 0.4-0.6 mm) (Sultan, 1987; and Abdul-Sahib, 1989).

The length and width of snails and mussels were measured under dissecting microscope, while annelids was anesthetized by drops of formaldehyde 10%, dehydration by series of ethanol 70,80,90 and 100%, clearing by white beech creosote and mounting on slide with use Canada balsam and cover slip. Identification of these organisms according to special references for each group (Chu, 1949; Edmondson, 1959; Ahmed, 1975; Holthuis, 1983; Frandsen, 1983; Salman, 1986; Ali, 1987, Al-Adhub, 1987; Al-Adhub and Hamzah, 1987; Rahma and Jaweir, 1990 and Saood, 1987, 1997).

3-Results

Table (1) showed number of macroinvertebrates species in restored marshes. 78 species were recorded in all monitored marshes comprised 17 snails, 40 insects, 4 shrimp and 4 Annelida, 3 of mussel, spider, and crab and two isopods and only one of Amphipod and cirriped. Maximum species were recorded in

Spring 30, 29 in Suq Shuyukh and East Hammar respectively while 26 during summer in Huywazah, and the minimum was recorded in summer in Suq Shuyukh and East Hammar Huwayzah 25 and 27 respectively. But in Huywazah lower value recorded ion Autumn and winter (16 species).

Table (1): Total number of Macroinvertebrates species in restored marshes during different seasons

group	Suq Shuyukh				Total species	Huwayzah				Total species	Hammar		Total species	Total species of all marshes
	Summer	Autumn	Winter	Spring		Summer	Autumn	Winter	Spring		Winter	Spring		
Snail	5	10	10	12	14	11	6	7	9	14	10	8	11	17
Insect	9	6	10	9	23	11	7	5	10	23	7	8	11	40
Shrimp	3	3	3	2	3	2	2	2	2	2	2	3	4	4
Mussel	2	3	2	2	3					0	1	2	2	3
Spider	1	1		2	2	1	1		1	1	1	2	3	3
Isopod	1	1			1					0	1	0	1	1
Amphipod	1	1			1					0	1	1	1	1
Crab	2			1	2					0	2	1	2	2
Annelid			1	2	2	1		2	2	3	1	2	2	4
Cirriped		1			1					0	1	1	1	1
Total	25	36	26	30	52	26	16	16	24	45	27	29	39	78

Table (2) showed occurrence species of macroinvertebrates in monitored marshes in various months of the year. Maximum species were recorded in Suq Shuyukh 52 species, including 14 snail, 23 Insect, 3 shrimp, 3 mussel, 2 crabs, 2 Annelid, 2 spiders,1 Isopod, 1 cirriped and 1 amphipod. In Huwayzah similar species recorded in Suq in both major groups (snail and Insect), 3 annelid, 2 shrimp and 1 spider. Minimum values was recorded in East Hammar 39 species including 11Snail, 11 Insect, 4 shrimp, 2 crabs, 2 Isopod, 2 mussel, 2 Annelid, 3 spider, I Cirriped and 1 amphipod.

Figure (1) illustrated comparison in density of main groups of macroinvertebrates between that of plant and substratum in monitored marshes. Density of macroinvertebrates was higher on plant in all groups except Burkah and Saddah (East Hammer), where bottom organisms were higher than on aquatic plant.

Table (3) explained density of main group of macroinvertebrates in monitored marshes. Maximum density was recorded in East Hammar for snail 11.32-15.6 ind. /m2 on plant and 29.3-27 ind/m2 on substrate, while minimum density recorded in Um Alnaaj substratum (Huwayzah) 2.2 ind. /m2. Maximum value for insect in Burkah substratum 6.3 ind/m2 and minimum value in Suq Shuyukh substratum 0.33 ind. /m2. Maximum value for shrimp was recorded on plant of Um Alnaaj 15.2 and minimum value on plant of Amia 6.9 ind. /m2.

Table (2): Occurrence of macroinvertebrate species in Suq Shuyukh, Huwayzah, and Hammar

Species	group	Suq Shuyukh	Huwayzah	Hammar
Bellamya bengalensis	S	+	+	+
Bellamya unicolor	S	+	+	+
Bulinus truncatus	S	+	+	
Gyraulus costulatus	S	+	+	+
Lymnaea auricularia	S	+	+	+
Lymnaea gedrosiana	S	+	+	
Lymnaea natalensis	S	+	+	+
Melanoides nodosum	S	+		
Melanoides tuberculata	S	+	+	+
Melanopsis nodosa	S	+	+	+
Melanopsis praemorsa	S	+		+
Physa acuta	S	+	+	+
Pila ovatus	S	+		
Theodoxus niloticus (jordani)	S	+	+	+
Unidentified snail	S		+	+
Gyraulus convexiusclus	S		+	
Hydrobidae gen. sp.	S		+	
Sum		14	14	11
Total snail	71			
Agrion sp.	I	+	+	+
Agrion splendens	I	+		
Anabrus sp.	I		+	
Anisoptera	I	+		
Belostoma sp.	I	+	+	
Belostomidae	I	+		
Blue large dragon	I	+		
Coenagrionidae	I			+
Coleoptera Fam.1	I	+	+	+
Coleoptera Fam.2	I		+	
Coleoptera Fam.3	I	+	+	
Coleoptera Larvae	I		+	
Corixidae	I	+		
damselfly1	I		+	+
damselfly2	I		+	
Dixidae	I		+	
Dytiscidae	I		+	

Species	group	Suq Shuyukh	Huwayzah	Hammar
Ephemeridae	I			+
Gerris sp.	I	+		
Gomphidae	I	+		
Gomphoidus sp.	I	+		
Gryllotalpa sp.	I		+	
Hemiptera	I		+	
Insect larvae1	I	+	+	+
Insect larvae2	I		+	
Ischnura sp.1	I	+	+	+
Ischnura sp.2	I	+	+	
Large dragon1	I			+
Lestidae	I	+	+	
Lethoecrus sp.	I	+		
Libellula sp.	I	+	+	
Libellulidae1	I	+	+	+
Libellulidae2	I	+		
Melaoplus sp.	I	+		
Neuoptera	I		+	
Notonectidae	I		+	
Odonata nymph	I	+		
Planorbine	I		+	
Plecoptera	I	+	+	+
Unidentified *insect*	I			+
Sum		23	23	11
Total insect	40			
Ataephyra d. mesopotamica	SH	+	+	+
Caridinia baboulti basrensis	SH	+	+	+
Macrobrachium equidens	SH	+		+
Macrobrachium rude	SH			+
Sum		3	2	4
Total Shrimp	4			
Elamenopsis kempi	Cr	+		+
Sesarma boulengeri	Cr			+
Sesarma sp.	Cr	+		
Sum		2	0	2
Total Crab	3			
Annine mesopotamica	IS			+
Sphaeroma annandelli	IS	+		+
Sum		1	0	2
Total Isopod	2			

Species	group	Suq Shuyukh	Huwayzah	Hammar
Corbicula fluminea	M	+		+
Corbicula fluminalis	M	+		+
Unio tigrids	M	+		
Sum		3	0	2
Total Mussel	3			
Paryhale basrensis	A	+		+
Sum		1	0	1
Total Amphipod	1			
Anellida	AN	+		+
Lumbricus	AN		+	
Oligochaet1	AN	+	+	+
Oligochaet2	AN		+	
Sum		2	3	2
Total Annelid	4			
Aranidae 1	Sp	+	+	+
Aranidae 2	Sp			+
Aranidae 3	Sp	+		+
Sum		2	1	3
Total Spider	3			
Balanus amphitrite amphitrite	C	+	0	+
Sum Cirriped		1		1
Total cirriped	1			
Sum Macroinvertebrates		25	43	39
Total Macroinvertebrates		78		

A: Amphipod, An: Annelida, C. Cirripedia, Cr: Crab I: insect, Is: Isopoda , M: Mussel, S: Snail, Sh: Shrimp, Sp: Spider

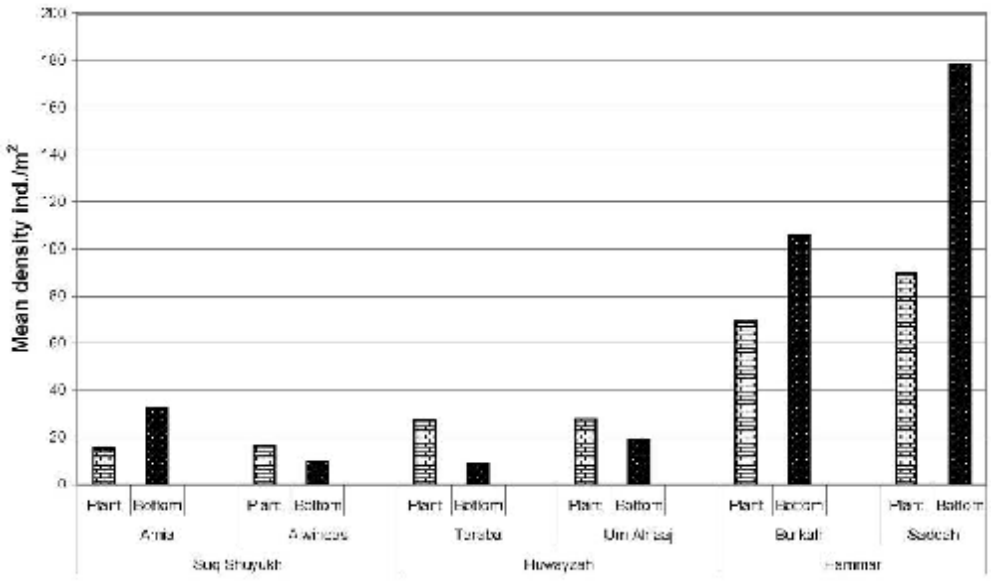

Fig. (1): Mean density (ind./m^2) of macroinvertebrates species in Suq Shuyukh, Huwayzah, & E. Hammar during study period

Table (3): Mean of Density ind./m^2 of macroinvertebrates species of each group of monitored marshes

Group	Suq Shuyukh				Huwayzah				E. Hammar			
	Aquatic plant		Bottom		Aquatic plant		Bottom		Aquatic plant		Bottom	
	Amia	Alwineas	Amia	Alwineas	Taraba	Um Alnaaj	Taraba	Um Alnaaj	Burkah	Saddah	Burkah	Saddah
Snail	2.1	3.1	6.0	3.7	4.1	4.9	5.0	2.2	11.3	15.6	27.0	29.3
Insect	1.9	1.8	0.3	0.0	4.0	4.7	0.0	0.0	4.3	4.1	6.3	3.9
Shrimp	6.9	10.5	0.0	0.0	14.3	15.2	0.0	0.0	14.4	9.3	0.0	0.0
Spider	0.5	1.0	0.0	0.0	2.8	2.0	0.0	0.0	2.3	1.0	0.0	0.0
Annelid	0.3	0.0	6.7	4.6	2.0	1.0	4.0	16.4	7.4	9.8	22.5	2.0
Mussel	0.0	0.0	1.2	1.3	0.0	0.0	0.0	0.0	0.0	0.0	2.8	3.3
Amphipod	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	13.6	0.0	0.0
Isopod	0.0	0.0	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	140.0
Crab	0.8	0.0	1.0	0.0	0.0	0.0	0.0	0.0	10.5	11.5	0.0	0.0
Cirriped	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	6.7	5.0	0.0	0.0
Total	15.1	16.4	32.6	9.5	27.1	27.8	9.0	18.6	69.0	69.8	105.6	178.5

Table (4) showed seasonal changes in macroinvertebrates numbers according to their groups in monitored marshes, maximum numbers were recorded in all groups in spring in Huwayzah and Suq Shuyukh, and most groups of East Hammar, while minimum values were recorded in summer in all marshes and groups except Suq snail was recorded in autumn.

Table (4): Seasonal numbers of individuals of different macroinvertebrates group in the monitored marshes (A: Huwayzah, B: Suq Shuyukh, C: E. Hammar)

A	Huywazah				
Season	Snail	Insect	Shrimp	Spider	Annelida
Summer	94	46	63	5	1
Autumn	122	90	194	17	0
Winter	99	11	71	0	21
Spring	254	194	272	0	103

B	Suq Shuyukh									
Season	Snail	Insect	Shrimp	Spider	Annelida	Mussel	Amphipoda	Isopoda	crab	Cirripedia
Summer	307	34	31	2	0	8	2	3	4	0
Autumn	244	95	220	3	0	8	3	30	0	1
Winter	529	54	253	1	0	3	0	0	0	0
Spring	901	100	331	2	30	20	0	0	4	0

C	E. Hammar									
Season	Snail	Insect	Shrimp	Spider	Annelida	Mussel	Amphipoda	Isopoda	crab	Cirripedia
Winter	1814	125	79	4	3	7	40	224	10	30
Spring	1501	54	112	4	76	15	86	0	55	15

Figures (2, 3, and 4) explained percentage of abundance of main groups of macroinvertebrates in monitored marshes, Insect was decreased 5.5 % in winter of East Hammar in comparison to 23.6 % in spring of Huywazah. Snail was decreased in autumn of Huwazah and spring of Huwazah 28% and 30 % respectively in comparison to 45 % and 49 % in summer and winter respectively. While shrimp exhibited relatively comparable status during all season except that in winter 45 %. In Suq Shuyukh snail recorded maximum values in summer 78.5 % and decreased to 40.3% in autumn, and comprised two third of total macroinvertebrates in winter and spring. Shrimp was decreased to the minimum in summer 7.9 % and increased to one third of macroinvertebrates 36.5 % and 30.1 % in autumn and winter respectively. Insect did not exceeded 10 % in all seasons accept autumn 15.7 %. Others group were very few and comprised 0.5 -12.5 % in different seasons in Suq and Huywazah and 13 % and 14 % during spring and winter respectively.

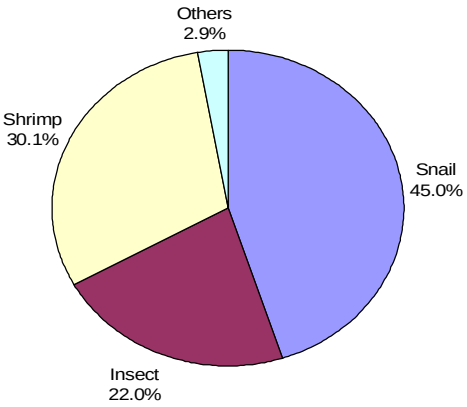

Fig. (2a): Abundance of main groups of macroinvertebrates in Huwayzah during Summer

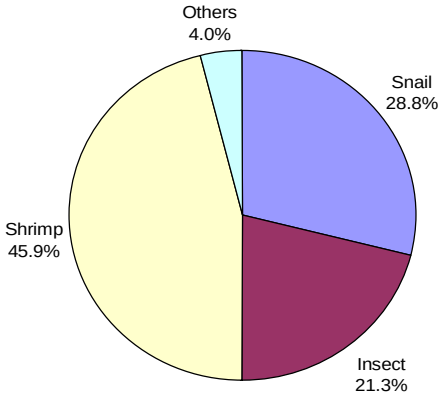

Fig. (2b): Abundance of main groups of macroinvertebrates in Huwayzah during Autumn

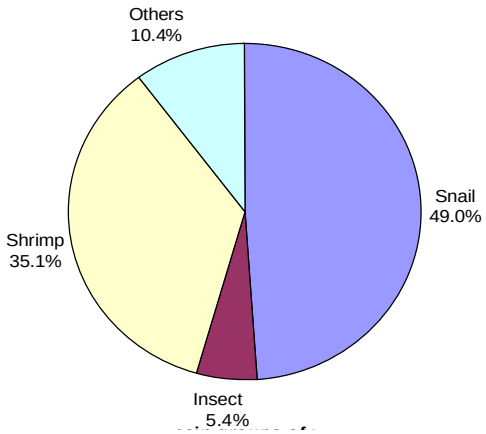

Fig.(2c): Abundance of main groups of macroinvertebrates in Huwazah during Winter

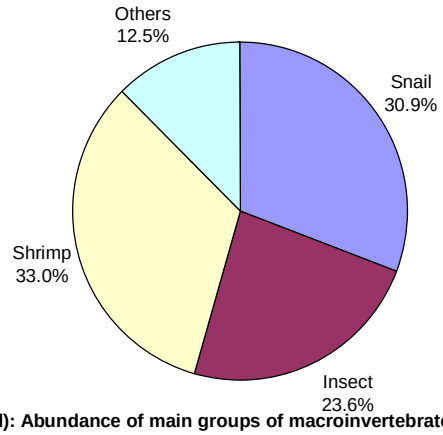

Fig. (2d): Abundance of main groups of macroinvertebrates in Huwayzah during Spring

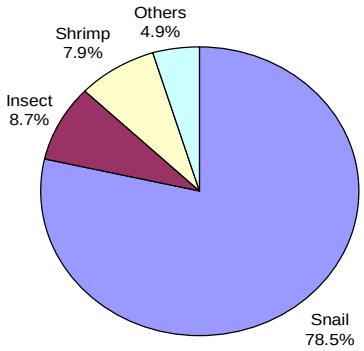

Fig. (3a): Abundance of main groups of macroinvertebrates in Suq Shuyukh during Summer

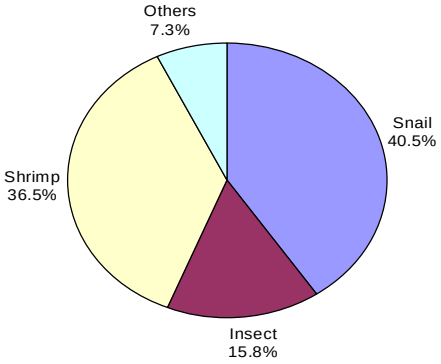

Fig. (3b): Abundance of main groups of macroinvertebrates in Suq Shuyukh during Autumn

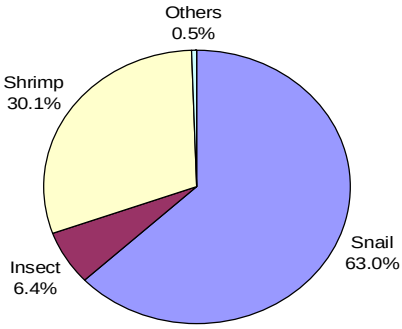

Fig. (3c): Abundance of main groups of macroinvertebrates in Suq Shuyukh during Winter

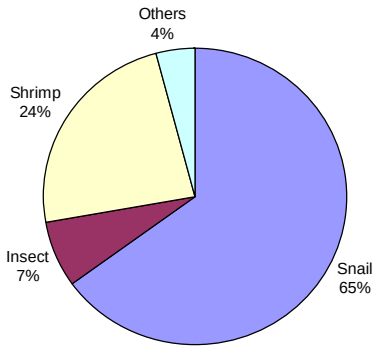

Fig. (3d): Abundance of main groups of macroinvertebrates in Suq Shuyukh during Spring

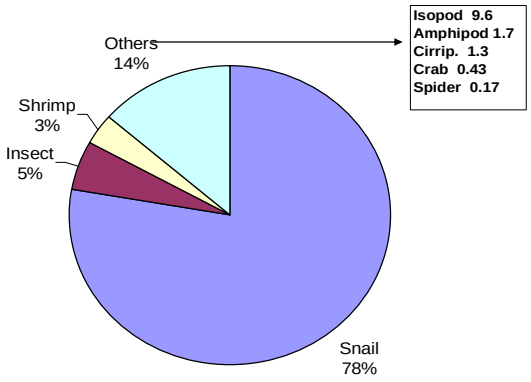

Fig. (4a): Abundance of main groups of macroinvertebrates in E. Hammar during Winter

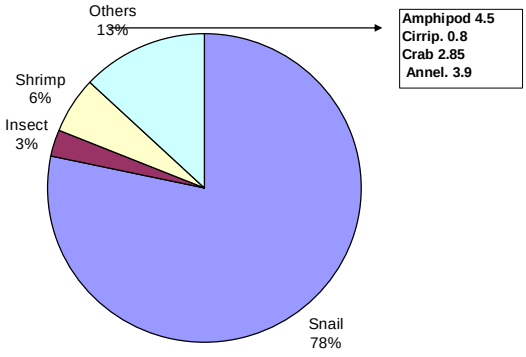

Fig. (4b): Abundance of main groups of macroinvertebrates in Suq Shuyukh during Spring

Table (5) explained seasonal changes in diversity, Richness and Evenness in each group of macroinvertebrates in monitored marshes. Generally Snail has higher values of diversity in all marshes, moreover East Hammar was higher than that in other marshes in biological indices. Evenness was found to be 0.71 for shrimp in Huwayzah in comparison to Suq Shuyukh 0.45 and East Hammar 0.13. Higher diversity of shrimp in Suq Shuyukh 0.73, while insect had a comparable in seasonal values and low in all ecological indices between Huwayzah and Suq Shuyukh.

Table 5 :- Seasonal diversity, Richness and Evenness for each group of macroinvertebrate in monitored marshes

Huwayzah	summer			autumn			Winter			Spring			Total		
	Div	Rich	Even	Div	Rich	Even	Div	Rich	Even	Div	Rich	Even	Div	Rich	Even
Snail	1.33	7	0.11	0.57	3	0.1	0.91	4	0.13	0.64	2	0.07	0.86	3	0.06
Insect	0.67	3	0.37	0.38	3	0.3	0.21	3	0.13	0.89	5	0.39	0.53	7	0.24
Shrimp	0.33	2	0.38	0.61	2	0.02	0.57	2	0.82	0.51	2	0.73	0.56	2	0.71
Suq	summer			autumn			winter			Spring			Total		
Shuyukh	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness
Snail	1.76	2	0.25	1.15	10	0.1	0.33	9	0.03	0.33	10	0.02	0.89	5	0.05
Insect	0.5	4	0.38	0.57	5	0.37	0.31	6	0.13	0.63	7	0.13	0.45	1	0.2
Shrimp	0.25	1	0.16	0.56	5	0.51	0.17	2	0.03	0.03	2	0.7	0.73	1	0.45
E.Hamm	summer			autumn			Winter			Spring			Total		
	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness	Diversity	Richness	Evenness
Snail	-	-	-	--	--	-	1.65	10	0.14	1.08	8	0.12	1.36	9	0.11
Insect	-	-	-	-	-	-	0.14	1	0.07	0.08	4	0.04	0.11	1	0.02
Shrimp							0.11	3	0.15	0.1	3	0.09	0.1	1	0.13

4-Discussion

The highest number of the macroinvertebrates was recorded in Suq Al-Shuyukh in comparison with Huwayzah and East Hammar, could be related to Physico-chemical characters of the water substratum and water regime.

Species composition of the three monitored marshes were similar to that recorded in the other Iraqi rivers and lakes except five snails *Bellamya unicolor* , *Pila ovatus* , *Melanoides nodosum* , *Melanopsis praemorsa* and *Gyraulus costulatus*, two shrimps *Macrobrachium equidens* , *M. rude* and one crab *Sesarma* sp.

Insect group was better in Suq Shuyukh and Huywazah exhibit a low number compose to East Hammar. The same was found other groups like crab, Isopods, Amphipods presence in low number represent a very important as food items for fish and birds.

Most species of macroinvertebrates were previously recorded in Iraqi rivers and lakes (Ahmed, 1975; Ali,1976; Ali,1979; Hamzah, 1980; Frandsen,1983; Rasheed,1985; Al-Azawi, 1986; Dauod *et al*.,1986; Salman, 1986; Saood,1987; Sultan,1987; Al-Adhub, 1987 ; Al-Adhub and Hamzah,1987; Abdul Saheb, 1989; Abdullah, 1989; Ali,1989; Sultan, 1992 and Al-Qarooni,2005).

Ali (1978 a, b) recorded 55 species of family Dystiscidae and 15 species of beetle belong to Gyrinidae, beside several species of Ischnura were recorded. Al-Adhub (1987), Al-Adhub and Hamzah (1987) descriptions two new subspecies of freshwater shrimps belong to Atyidae.

Few species dominated the restored marsh like one species of insect *Ischnura* sp., one species of shrimp *Caridina b. basrensis* and species bivalve *Corbicula fluminaea* in Suq Shuyukh, while in Huwayzah Marsh two species of insect *Ischnura* 1 and Coleoptera 1 and two species of shrimp *Caridina b. basrensis* and *Ataephyrad. mesopotamica.* Insect and Crustacea were presence in low number of species and individuals even they are the biggest macroinvertebrates groups.

Due to few historical data available about the southern marshes, could led to wrong impression that the restored marshes were better since the number of species recorded recently was equal to historical data as below:-

Group	Sultan,1991	Present study
Snail	23	17
Insect	24*	22
Shrimp	4	6
Crab	3	2
Mussel	4	3
Spider	-	3
Amphipod	-	1
Isopod	-	1
Annelida	-	2
Cirripedia	-	1
Total	58	58

* Rahma and Jaweir, (1990)

Time factor must be considered, since the recently undulating marshes were 14 month in age.

Recently Al-Qarooni (2004) was recorded only five species of snails (*Lymnaea auricularia, Physa acuta, Bellamya bengalensis and*

Gyraulus sp.) in three southern restored marshes during six months.

Percentage of abundance in Suq Shuyukh and East Hammar were higher than Huwayzah could be related to the substratum nature resulting in low presence of few species in bottom substrate like *Melanoides tuberculata*, *Lymnaea* spp., *Physa acuta*, *Theodoxus jordani* and *Gyraulus costulatus.*

Insect group was better in Suq Shuyukh and Huywazah exhibit a low number than East Hammar the same was true for other groups like crab, Isopods, Amphipods presence in low number represent a very important as food items for fish and birds.

The density of macroinvertebrates reached the highest level in East Hammar and on aquatic plant more than bottom sediment, except Burkah (East Hammer) and Um-Al-Naaj (Huywazah) stations could be due to soft substratum which allowed to Snails, mussel and Annelida to exist.

The comparison of density of bottom macroinvertebrates of present monitored program and few previous studies in middle of Iraq (Al-Rubaee, 2001 and Radhi et al., 2004) lead to conclusion that snail density was comparable, while Annelida and insects densities, where much lower than what had been recorded Radhi et al. (2004).

The reason of increase of macroinvertebrates densities on aquatic plant more than bottom sediment could be attributed to the hardness of bottom due to desiccation process. Hence aquatic plants and macroalgae such as Spirogyra sp. and Chara sp. played more successful as host, Shelter and food for macroinvertebrates than the hard substrate.

The high density of sub-merged aquatic plant had a major role in abundance of all different organisms as food and protection. We assumed that some species of macroinvertebrates could limit by occurrence of certain species of aquatic plants as showed in Suq Shuyukh more species of Macroinvertebrates than Huwayzah.

We deduced that highest number of individual of macroinvertebrates recorded in Spring in all monitored marshes which conceded with increase of Phytoplankton and Zooplankton, while the lowest number of individual of macroinvertebrates were recorded in Summer conceding with increase in number of species.

Snail's density increase during spring and autumn, Shrimps decrease during these seasons and increase in summer and winter which could be related to their life cycles or availability of foods. We noticed seasonal alternative densities between snail and shrimp in Suq Shuyukh and Huwayzah. Insect was the most affected group by low temperature, still Annelida was lowest group, but their numbers increase slowly with the time.

Diversity values were low for all groups except snail due to dominance of few species of insect Ischnura and Coleoptera, one species of bivalve and two species of shrimps. This was an evident of the newness of the recently undulating

marshes. In natural healthy marsh the species were evenly distributed (Johansson, 2003).

High ecological indices were recorded for shrimp in Suq Shuyukh more than Huwayzah and East Hammar, but still in the range of recently undulating marshes (Johansson, 2003).

Richness values for snail were high especially in Suq Shuyukh and East Hammar reflecting the evenly distributed, but richness values for insects and shrimp were still disturbed.

Evenness of most groups except shrimp reflect disturbs distribution for individuals against species.

Conclusions

1- Numbers of individuals were low in all groups except shrimp.

2- The restoration on function level was good especially on submerged plants and clear relationship was existed between type of aquatic plants and species of Macroinvertebrates.

3-Hard substratum in most stations hinders the living of many macroinvertebrates such as Annelida, crustacean and Insects.

Recommendations

1- Details investigate the dispersal of the rare species found in this study such as snail *Pila ovatus*, Caddis fly and crab *Sesarma* sp.

2-Continuous monitoring of species composition in the southern marshes like mussel.

3-Details studying of different macroi-nvertebrates that live on sub merged plant and highlighted on their importance as food items.

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وفرة وتواجد والتغيرات الفصلية وتركيبة الانواع الافقريات في الاهوار المؤهلة الجنوبية العراقية

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الخلاصة

سجل 78 نوع من اللافقريات الكبيرة في كل الاهوار الثلاثة المؤهلة خلال الفترة المحصورة حزيران 2004 حتى أيار 2005 والتي شملت 17 نوع من القواقع، 40 نوع من الحشرات، اربعة انواع من كل من الروبيان و الديدان الحلقية وثلاثة من كل من المحار والعنكبوت والسرطان، اثنان من متشابهة الاقدام، 1 من مزدوجة الاقدام 1 من ذوابية الاقدام.

سجلت أعلى الكثافات من اللافقريات الكبيرة على النباتات المائية في كل المجاميع والمحطات ماعدا محطتي السدة والبركة في شرق الحمار اذ كانت الكثافة اعلى في القاع. كان سوق الشيوخ أكثر الأهوار تسجيلا للأنواع إذ بلغت 52 نوعا بينما أقلها سجل في شرق الحمار 39 نوعا. سجل أعلى الكثافات في شرق الحمار للقواقع وتراوحت من 11.32 إلى 15.6 فرد/ م2 على النبات و 27 إلى 29.3 فرد/ م2 على القاع، بينما أوطأ الكثافات كانت في محطة أم النعاج . بلغت أعلى القيم للحشرات في قاع محطة البركة وبلغت 6.3 فرد/ م2 وأوطئها في قاع سوق الشيوخ 0.33 فرد/ م2. سجل أعلى القيم للروبيان المتواجد مع نباتات محطة أم النعاج 15.17 فرد/ م2 وأوطئها مع نباتات محطة العمية 6.9 فرد/ م2. لوحظ تباين موسمي في أعداد اللافقاريات وكانت أعلى القيم خلال فصل الربيع بينما أوطأها في فصل الصيف في جميع محطات الدراسة.

وضحت قيم الدلائل الحيوية أن أعلى القيم للتنوع الحياتي كانت للقواقع في جميع الأهوار المؤهلة كما أن هور شرق الحمار سجل أعلى القيم لكل الدلائل الحيوية مقارنة بهوري الحويزة و سوق الشيوخ. وجد أن أعلى قيم التكافؤ كانت للروبيان بلغت 0.71 في هور الحويزة مقارنة بسوق الشيوخ 0.45 و شرق الحمار 0.13 . بلغت أعلى القيم للتنوع الحياتي للروبيان 0.17 في سوق الشيوخ بينما كانت قيم الحشرات واطئة ومتقاربة بين هوري الحويزة و سوق الشيوخ.