

MONTHLY CHANGES OF NUTRIENTS, CHLOROPHYLL AND ROTIFERA IN THE SHATT AL-ARAB RIVER, SOUTH OF IRAQ

H.K. AHMED , D.S. ABDULLAH AND M.H. ALI

Marine Science Center, Basrah university, Iraq. Dept. of Marine Biology.

ABSTRACT

The species composition of rotifers and the relative abundance of each species in the community ,the chlorophyll and nutrients concentrations were studied in the Shatt Al-Arab River at three stations: (st.1) Al-Dair bridge, (st.2) Saad bridge and (st.3) Khalid bridge , during the period from May to October 2000. The population of rotifers was composed of 23 species .The highest number of rotifers species (15) were recorded at st.1. The density of rotifers were decreased in May at st.1 and 3 (66 and 50 indiv./ m³ respectively), and peaked during October at st.2 (17950 indiv./ m³).The highest chlorophyll-a concentration was found in May at all stations (20.2, 37 and 40 mg/m³ at st.1 ,2 and 3 respectively). The highest concentration of PO₄ was recorded in July at st.1 and 2 , while a peak in October at st.3 was occurred. The NO₃ concentrations were increased at June in st.1 , st.2 and a peak at st.3 in July was noticed.

INTRODUCTION:

Few studies have been done on the ecology and species composition of the planktonic rotifers in the southern part of Iraqi waters. Abdual-Hussein *et al.* (1989) investigated the *Brachionid* rotifers in the Shatt Al-Arab River. Ali and Abdulla (1999) studied the relation between the rotifer biomass and the phytoplankton in Shatt Al-Arab River between Al-Chibassy and Al-Khora, whereas the major part of the river have not been investigated.

The abundance of various species and the diversity of rotifers community can be greatly influenced by the algal density and the other micro-organisms such as bacteria and flagellates (Chang, 1983; Arndt, 1993). Furthermore , it has been reported that rotifers can be greatly influenced by increasing of the particulate organic matter and dissolved substances indirectly (Pourriot, 1965; Arndt, 1993).

In general , rotifers are considered a good bio-indicators for the water quality of various aquatic habitats such as, pollution , nutrification and toxicity (Sladeczek, 1983). Out through the present study , the rotifers community was investigated qualitatively and quantitatively in the region of the Shatt Al-Arab river located between Al-Dair and Khalid bridge (the abundance and diversity of the rotifer community).

MATERIALS AND METHODS:

Samples were collected monthly from May to October 2000. Three stations were selected in the Shatt Al-Arab river .The first one at Al-Dair bridge ; the second at Saad bridge and the third at Khalid bridge (Fig.1). At stations 1 & 2 and from June to October at station 3. Sampling of

rotifers were collected from a depth of about 1m below the water surface with a 50 μm mesh plankton net (mouth aperture of 10 cm diameter). For quantitative estimates of rotifers density, 5 replicates of 10 m distance were filtered through the net. Rotifers specimens were preserved in 4% formaline before identified and counted under microscopes.

For chlorophyll (a) determination, plant pigments were extracted with 90% aqueous acetone and chlorophyll-a concentrations were determined spectrophotometrically.

Water samples were taken and analysed for nutrients, NO_3 and PO_4 determination, which have done spectrophotometrically according to Parsons *et al.* (1984). During the sampling time water temperature and salinity were measured digitally in the field by (Kent (EIL 5005) Salinity and Temperature Bridge Type M.S.C.).

RESULTS: DISTRIBUTION AND ABUNDANCE OF ROTIFERS:

Table 1. gives the list of the rotifer species at all station and fig.1. Shows the species composition of the rotifers community and the relative abundance of each species in the three studied stations. The highest number of rotifers species (15) were recorded in station 1 (Al-Dair bridge). In station 2 (Saad bridge) there were 13 species, whereas only 9 species are recorded in station 3 (Khalid bridge). At st.1 species 1 and 2 (*Ascomorphella* sp. and *Ascomorpha* sp.) were the most abundant and constituted about 41% and 15.7% of the community respectively. At st. 2 species 1 and 2 were also dominate the community, but they constituted about 38.6% and 51% of the rotifers respectively. It seems that these 2 species

have different relative abundance at stations 1 and 2. However, at st. 3 species 3 *Keratella tropica* was the most abundant, followed by sp.1 *Ascomorphella* sp. and constituted about 42.8% and 25.7% of the result of the total rotifers community respectively. The total rotifers density at the three studied stations showed that the higher density 24077 (ind./m³) was found at st.2. Whereas, the density declined to 6546 and 1881 (ind./m³) at st.1 and st. 3, respectively.

The density of rotifers peaked in July at st.1 and st.3, whilst at st.2 it peaked in October.

PHYTOPLANKTON:

The phytoplankton biomass estimated in terms of chlorophyll-a were measured during the period of the study (Fig.2). The highest concentrations were found in May at the stations 1 and 2. At st.1 the chlorophyll-a concentration was about half of that recorded at st. 3 (20.2, 37 and 40 mg chl./ m³ in st.1, 2 and 3 respectively). However, these values declined sharply toward their minimum in September or October at all stations.

NUTRIENTS:

The variations of nutrients concentrations (phosphorus and nitrogen) during the period of six months of the study for all stations are given in Figs.4 and 5. The monthly mean concentration of PO_4 was increased from 0.1416 mg/m³ at st.1 to 0.1772 mg/m³ at st.2 and rising to 0.2617 μg at P- /l at st.3. At all stations the peak concentration of PO_4 was recorded in July.

The monthly mean concentration of NO_3 was low at st.1 (12.49 mg/m³) and increased to 17.6 mg/m³ at st.2 and 17.03 μg at N-/l at st.3. However, peaks of concentration were recorded in June at st.1 and st.2, whilst the peak was recorded in July at st.3.

TEMPERATURE AND SALINITY:

During the period of the study temperature was fluctuated between 24 and 33 C° and the highest record of water temperature were during July and August

.at all stations (Table 2). Salinity was fluctuated between 1.5 and 2.5 ‰ at all stations.

Table 1. Taxa- composition of rotifers community identified at three stations of Shatt Al-Arab River (Al – Dair bridge, saad bridge and Khalid bridge) during the period (May – October 2000)

Species List No.	Taxa- composition
1	<i>Ascomorphella</i> sp.
2	<i>Ascomorpha</i> sp.
3	<i>Keratella tropica</i>
4	<i>Synchaeta</i> sp.
5	<i>Epiphanes</i> sp.
6	<i>Gastropus</i> sp.
7	<i>Resticulas</i> sp.
8	<i>Aspianchnopus</i> sp.
9	<i>Brachionus urcellaris</i>
10	<i>B.quadridutatus</i>
11	<i>Colurella</i> sp.
12	<i>Notholca squamula</i>
13	<i>Trichocerce</i> sp.
14	<i>Filina</i> sp.
15	<i>Ntomata</i> sp.
16	<i>Asplanchna</i> sp.
17	<i>Cephalodella</i> sp.
18	<i>Monostyla</i> sp.
19	<i>Lecane</i> sp.
20	<i>Cupelopagis vorax</i>
21	<i>Pseudoharringia</i> sp.
22	<i>Dipleuchlanis</i> sp.
23	<i>Keratella quadrata</i>

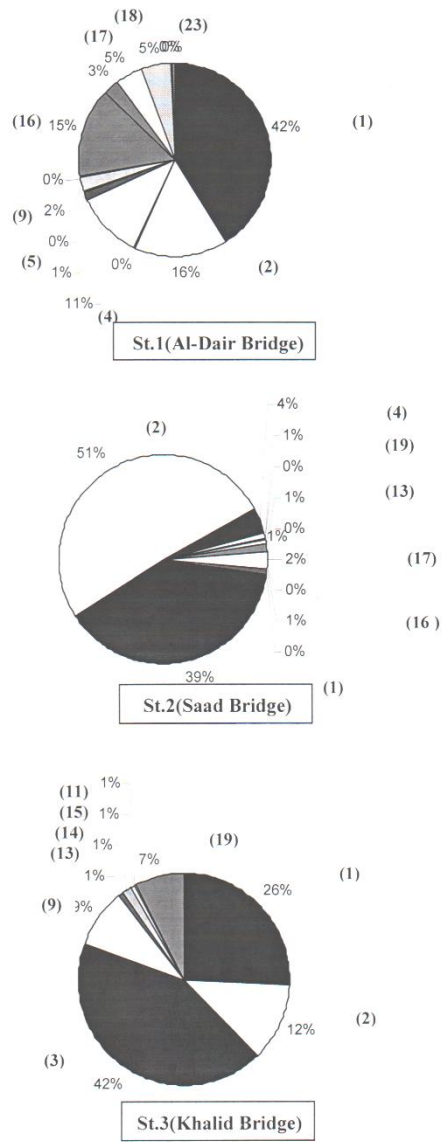


Fig.1. The relative abundance of each rotifers species in the three studied Stations,the numbers in brakets refer to the species names as in Table (1).

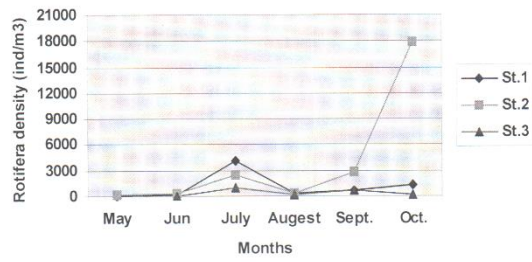


Fig.2. The total density of rotifera in three studied stations of Shatt Al-Arab River during the period May – Oct. .2000.

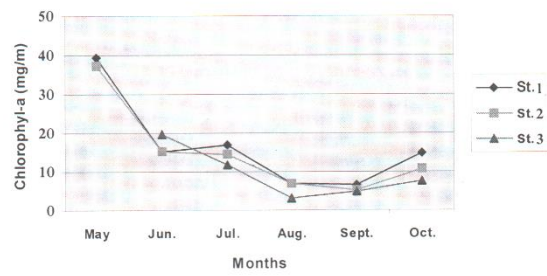


Fig. 3. The phytoplankton biomass in term of chlorophyll-a measured during the period of the study May – Oct..2000 in three stations of Shatt Al-Arab River.

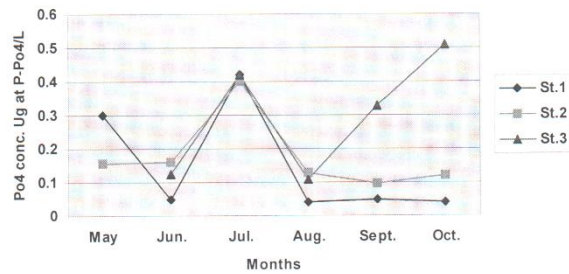


Fig.4. The monthly variations of phosphorus concentration during the period May – Oct. 2000 in three stations of Shatt Al-Arab River.

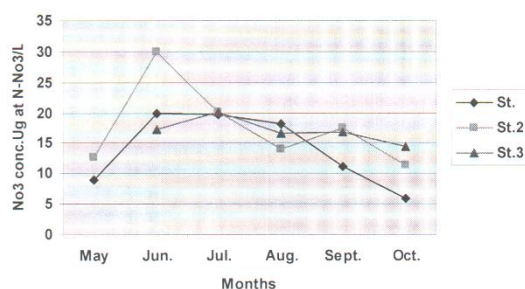


Fig.5 The monthly variations of nitrogen concentration during the period May – Octo.2000 in three stations of Shatt Al-Arab River.

Table 2. The means of temperature (TC°) and salinity (S‰) in the water of the three studies stations of Shat Al-Arab during the period of study(May – Oct. 2000).

Stations	Al-Dair bridge (St.1)		Saad bridge (St.2)		Khalid bridge (St.3)	
	T.	S.	T.	S.	T.	S.
Months						
May	26.3	2.3	26.3	2.19	-	-
June	24	2.1	26	2	26	2.4
July	30.5	2.1	32	2.1	33	2.35
August	30	2	30	1.5	32	1.5
September	25.7	2	26	2.05	26.75	2.06
October	28	2	28	2.5	28	2.6

DISCUSSION:

Rotifers had been considered a good bioindicator of water characteristics such as organic pollution , sewage ,industrial wastes , toxicity , physical factors ,radioactivity ,eutrophication , salinity and other unknown factors (Sladeczek , 1983).These characteristics, actually, comes from the ability of these animals to utilizing particulate organic matter directly as well as the micro-organisms such as algae , bacteria and protozoa (Pourriot, 1965; Arndt, 1993). ultimately this mean that the abundance and

species composition of these animals can be used as index of water quality.

Shatt Al-Arab river system which run from Qurna City to Fao is inhabited by different groups of invertebrates, but most of these groups have low species diversity as compared with Rotifera . For example we can find 3 species of crabs, 3 species of isopods , 9 species of gastropods , 3 species of bivalves etc. However, other groups such as Cladocera include relatively higher number of species (Ali, 1989; Abdul-Hussein *et al.*, 1989; Ageel *et al.* ,2000) .

In the light of these facts, it was expected to find a specified rotifers diversity in and near the area of the discharges effluents of the paper factory in Al-Dair region. Nevertheless, the results revealed a quite different species composition of rotifers compared with that found in the Shatt Al-Arab river in the region between Al-Chibassy and Al-Khora (Abdul-Hussein *et al.*, 1989; Ali and Abdullah, 1999), through the recording of 15 species belonging to 14 genera in the present investigation which were not listed in the previous mentioned studies. Particular evidence come from those species of the genera *Ascomorphella* and *Ascomorpha* which were the dominant rotifers in the present study at least in the stations 1 and 2 at the time the species of the genera *Notholca* and *Keratella* were dominating the rotifers community in Shatt Al-Arab between Al-Chibassy and Al-Khora (Ali and Abdullah, 1999). However, at station 3 of the present study, the genera *Keratella* was the most abundant and obviously this station is the nearest station to Al-Chibassy site where the two previous studies of Abdul-Hussein *et al.* (1989) and Ali and Abdullah (1999) were done. In general, it can be demonstrated that the composition and the relative abundance of species in the rotifers community are quite different in the two areas. Actually these results are well coincide with that of chlorophyll-a contents which indicated a high values (16.1-13.7 mg/m³) at stations 1 and 2, respectively i.e. the areas located in the upper stream and in that the gradual declined of the values (9.06 mg/m³) down stream (station 3) this is quite right too in Al-Ashar station were the recorded values were ranged 0.23-1.735 mg/m³ (Ali and Abdullah, 1999).

In fact, the presence of the paper factory at the site between station 1 and 2 i.e. between Saad bridge and Al-Dair bridge, may imply an effective role on the rotifer

community through the discharged waste water of the industry to the river. Here the high chlorophyll concentration obtained reflecting the high primary production. However, the obvious maximum mean rotifers density which recorded in this study at the station of Saad bridge (4018 ind/m³) when compared with that of the stations 1 and 3 (1811 and 376 ind/m³ respectively) and as well as with that of the Al-Ashar station (1851 ind/m³) (Ali and Abdullah, 1999) is well confirms this conclusion. Actually the relationship between the phytoplankton biomass and rotifers density is quite clear as the former form a basic food to the later (Downing and Rigler, 1984).

On the other hand, although the increase of nutrients concentrations may have a positive role on the rising of phytoplankton biomass, there are evidence that it may inhibited the rotifers growth as well as other zooplankton. Whereas the moderate concentrations of the particulate organic matter may resulting in higher production. For example Sarma, and Nandini (2002) reported that *Brachionus calyciflorus* did not maintain the population beyond a few days when growing in inorganically rich waste water examined from Mexico's largest food processing industrial sector which containing both particulate and dissolved matter of a concentration 16-32%. Whereas, at a diluted concentration (8%) high population density of rotifers was obtained. Furthermore they obtained a maximum density in two food combinations (diluted organic and algal foods). In the light of these data it is possible to conclude that the higher density of rotifers found in the water of Saad bridge station where the result of the indirect effects of discharges of the particulate organic matter from the paper factory in one side and in the other side is the presence of moderate concentrations of nutrients as compared with the two

extreme values, the lower concentrations at Al-Dair bridge station and the higher concentrations at the Khalid bridge station

(Figs.3,4) .the same explanation can be given to the finding of high phytoplankton biomass at the bite of saad bridge .

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التغيرات الشهرية للمغذيات والكلوروفيل وكثافة الدولابيات في شط العرب

جنوب العراق

هدى كاظم احمد , داود سلمان عبد الله , مالك حسن علي

قسم الاحياء البحرية/ مركز علوم البحار/ جامعة البصرة

الخلاصة

درست الكتلة الحية للهائمات النباتية والعناصر المغذية والتكوين النوعي والكمي للدولابيات لكل نوع في ثلاث محطات مختلفة من شط العرب المحطة الاولى (جسر الدبير) المحطة الثانية (جسر سعد) المحطة الثالثة (جسر خالد) للفترة من شهر ايار ولغاية تشرين الاول 2000 . وجد ان مجتمع الدولابيات مكون من 23 نوع سجل منها 15 نوع في المحطة الاولى . بلغت كثافة الدولابيات ذروتها في المحطتين الاولى والثالثة خلال شهر ايار في حين كانت الذروة في شهر تشرين الاول للمحطة الثانية . سجل اعلى تركيز للكلوروفيل- أ - خلال شهر ايار (2 , 20 , 37 , 40 ملغم/م³) للمحطات الثلاثة على التوالي . سجل اعلى تركيز للفسفور في شهر تموز للمحطتين الاولى والثانية وبلغ ذروته خلال شهر تشرين الاول في المحطة الثالثة . اما تركيز النترات فقد وصل ذروته في حزيران للمحطتين الاولى والثانية وفي تموز للمحطة الثالثة .