Qualitative and Quantitative composition of Rotifers community in Eastern Euphrates drainage canal /Al- Qadisiyha province

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Abstract:

The qualitative and quantitative variations of the rotifera community was studied monthly for a period from October 2015 to September 2016 at three selected stations in eastern Euphrates drainage canal in the Al-- Qadisiyhia (Diwaniya) province. The results of this study were recorded 28 species of rotifera and seven of them were reported as dominant species over other species in study stations including a *Monostyla closterocerca*, *Polyarthra dolicoptera*, *Brachionus calyciflorus (*Long .splne*), Euchlanis delatata*, *Keratella cochlearis,Notholca acuminate* and,*Rotaria citrinus* . In the present study a number of genus appeared in more than one species such as genus Keratella in 4 species and genus Brachionus in 3 species and each of Euchlanis and Monostyla appeared in 2 species only .

The results showed that the highest monthly density was recorded in the station 1, which amounted to 2925 individuals / m3 in September 2016 and less density at the station 2 and reached 375 individuals / m 3 in July 2016

Key words: Rotifera ,Eastern Euphrates, Qadisiyha province

التركيب النوعي والكمي لمجتمع الدولابيات في مبزل الفرات الشرقي / محافظة القادسية

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الخلاصة :

درست التغيرات في نوعية وكثافة مجتمع الدولابيات شهريا للمدة من تشرين الاول 2015 ولغاية ايلول 2016 لثلاث محطات مختارة في مبزل الفرات الشرقي في محافظة القادسية . سجل خلال الدراسة الحالية 28 نوعا من الدولابيات كانت سبعة انواع منها سائدة على الانواع الاخرى في محطات الدراسة وهي

***Polyarthra dolicoptera* , *Brachionu scalyeiflorus (*Long .splne*)* , (*Monostyla closterocerca* , *Notholcaa cuminata* and *Rotaria citrinus*). , *Keratella cochlearis* , *Euchlanis delatata* ,**

ظهرت عدد من الأجناس بأكثر عدد من الانواع حيث ظهر جنس *Keratella* بـ 4 انواع و جنس Brachionus بـ 3 انواع و ظهر كل من جنس *Lecane* و جنس *Monostyla* بنوعين فقط.

اظهرت النتائج ان أعلى كثافة شهرية سجلت في المحطة 1 وبلغت 2925 فرد / م3 في شهر ايلول2016 وأقل كثافة في المحطة 2 وبلغت 375 فرد/م3 في شهر تموز2016.

كلمات مفتاحية : الدولابيات، الفرات الشرقي، محافظة القادسية

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Introduction :

Rotifers are microscopic invertebrate organisms without coelom and backbones considered as an important component of the zooplankton community ,they have a very wide range of morphological variations and adaptation which allows them to quickly adapt to new environmental conditions ,their body can be divided into head, trunk and foot with one or more toes[1], the head bears the rotator or the wheel organ for locomotion and food collection called carona from it drive their name[2] Rotifera include more than 2,000 species, that live mostly in fresh water, some species live at estuarine and a few present in the seas and oceans [3] Rotifera heterotrophic depends in feeding on plant, planktonic bacteria, other unicellular organisms and some of them feeding on predation[4] Rotifers are very important in food chains and food web of aquatic ecosystem they transfer energy from primary producers like bacteria and algae to consumers like crustacean, insects and small fish[5].The distribution of rotifera governed by interaction between biotic factors such as competition and predation by vertebrates and invertebrates, and abiotic factors such as temperature ,trophic state, dissolved oxygen, salinity and other physico-chemical characteristics[6] Among the zooplankton rotifers are dominance in aquatic environments which attributed to their parthenogenetic reproductive pattern and short life cycle under favorable conditions as well as the ability of rotifers to undergo vertical migration, which minimizes competition through niche exploitation and food utilization[1]They are very sensitivity and respond more quickly to the environmental modifications, make it good indicator for evaluating the ecological status and understanding functional properties of freshwater ecosystem[7] hence the changes in the composition of communities, abundance and diversity may be can used as best bio- indicators for different kinds of aquatic pollution and eutrophication[8]. . Many of the studie sthat focused on Rotifera groups in Iraqi aquatic environment such as[9] studied the effect of phytoplankton on rotifers biomass in the Shatt Al-Arab river[10] studied rotifera in Lakes Tharthar, Habbaniya and Razzazah[11] studied rotifera in the Shatt Al-Arab river,[12]studied biodiversity of rotifera in the upper region of Euphrates river,[13]studied qualitative composition and density of the rotifera in Al-Hillah drainage canal in Babil-province,[14]studied rotifera in the Al-Tharthar Canal and Euphrate River, Hammadi[15] studied rotifera in the Shatt Al-Arab river and[16]studied rotifera in Al- Hilla River.In this study we aimed to identify the rotifera community in eastern Euphrates drainage canal in Al-Qadisiya province.

Material and methods:

Study samples were taken monthly during the period from October 2015 to September 2016 at three selected stations in eastern Euphrates drainage canal in Al-Qadisiyha province (Figure1). water samples were collected from the surface layer of river water and measured following physico-chemical parameters :Water temperature, pH, Turbidity, Electric Conductivity, Dissolved Oxygen, Nitrate and Phosphate in the laboratory by using the standard methods of the[17].The rotifers samples were collected through the filtration 60 liters of water in the conical plankton net (55 µm mesh size) type (Hydro - Bios) and then samples were concentration to 10 ml and fixed with 4% formalin solution ,rotifers counted under a compound microscope using(Sedgewick-

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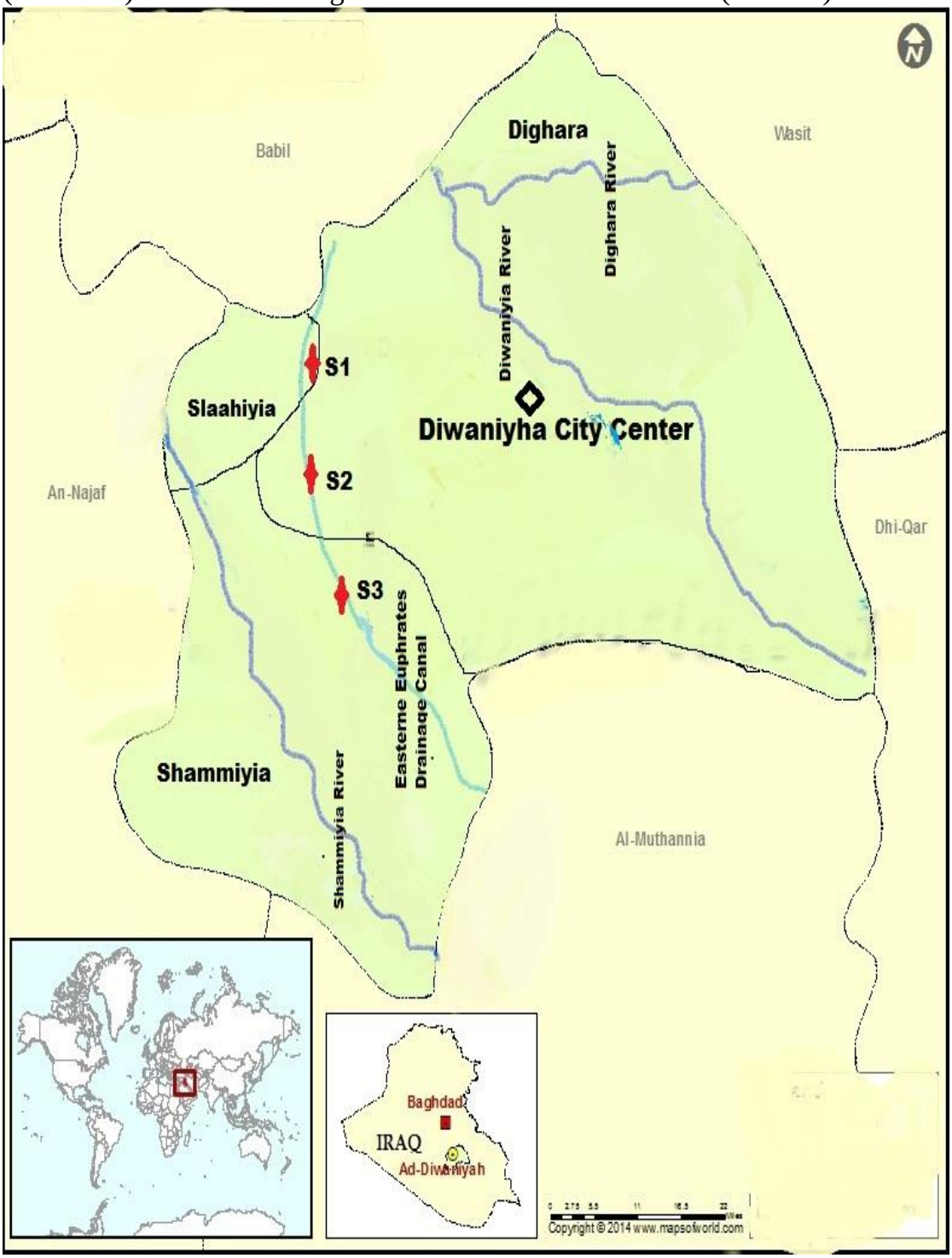
Rafter counting cells) ,and identified to the species based on the specialized literature as[18;19].the data expressed by (Ind./m^3). For statistical analysis ANOVA test was used (P <0.05) to detect significant differences between sampling stations and months, Pearson's correlation analysis was performed to evaluate the relationships between physico-chemical variables, rotifers densities (P <0.05).



(Figure -1). Map of the study area showing sampling stations

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Results and discussion : -

The physicochemical parameters are summarized in Table 1.

parameter	Station1 Range(Mean±SD)	Station 2 Range(Mean±SD)	Station 3 Range(Mean±SD)
Water Temperature °C	10-27 18.5±2.28	12-32 22±3.18	11-31 21±4.33
PH	7.8-8.2 8±0.26	7.7-8.5 8.1±0.12	7.5-8.4 7.95±0.13
Turbidity NTU	28-130 79±15.07	43-165 104±23.4	35-150 92.5±18.77
Electric Conductivity µS.cm-1	3950-7500 5725±985.1	4180-8720 6450±679.5	4220-7650 5935±894.75
Dissolved Oxygen (DO)mg.L-1	5.5-12.3 8.9±1.86	4.8-11.5 8.15±2.1	5.2-12 8.6±2.01
Nitrate µgm atN-NO3. L-1	38-85 61.5±11.2	41-72 56.5±9.65	32-77 54.5±7.82
Phosphate µgm atP-PO4. L-1	0.7-6.5 3.45±1.19	1-5.7 3.35±0.51	0.5-4.3 2.4±0.74

The water temperature values in present study were ranged between 10°C in January 2016 at station 1 and 32 °C in July 2016 at station 2 (Table-1). The pH ranged from 7.5 in December 2015 at the station 3 to 8.5 in October 2015 at station 2 (Table - 1). The turbidity in current study ranged from lower values 28 NTU in April 2016 at station 1 to highest values 165 NTU in October 2015 at the station 3 (Table-1).The Electrical conductivity (EC) values in this study ranged from 3950 µS.cm-1 in July 2016 at station 1 to 8720 µS.cm-1 in February 2016 at station 2 (Table-1).The dissolved oxygen values in this study ranged from 4.8 mg / L in July 2016 at station 2 to 12.3 mg/L in January 2016 at the station1 (Table-1). Nitrate were recorded in the current study ranged from the lower value 32µgm N-NO3. L-1 at station 3 in March 2016 and highest value 85 µgm N-NO3. L-1 in September 2016 at station 1 (Table- 1). The Phosphate values in the current study ranged between the lower value of 0.5 µgm at-PO4. L-1 at station 3 in May 2016 and the highest value 6.2 µgm at-PO4. L-1 at station 1 in September 2016 (Table-1).

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Table (2): Annual Density(Ind./m^3) ,(Annual percentage) , numbers of occurrence of rotifera species in the eastern Euphrates drainage canal for the period from October 2015 until September 2016.

	Station / Taxa	1	2	3
1	*Adineta vaga*	100(0.60)3	--	100(0.96)2
2	*Asplanchnopus myrmeleo*	50 (0.30)2	--	--
3	*Brachionus angularis*	850 (5.15)10	1025(8.40)8	700(6.76)8
4	*B. calyciflorus (*long Spine*)*	775(4.69)10	925(7.58)9	650(6.28)9
5	*B. calyciflorus* (short spine*)*	225 (1.36)3	200(1.63)4	--
6	*Cephalodella auriculata*	100(0.60)3	--	--
7	*Colurella adriatica*	700 (4.24)8	950(7.78)8	450(4.34)6
8	*Euchlanis deflexa*	75 (0.45)3	--	50(0.48)2
9	*Euchlanis delatata*	1100(6.66)10	1000(8.19)7	1000(9.66)10
10	*Epiphanes sp*	125(0.75)2	--	50(0.48)2
11	*Keratella cochlearis*	1600(9.69)11	1075(8.81)10	825(7.97)9
12	*K. quadrata (long. Spine)*	175(1.06)2	50(0.40)2	--
13	*K. quadrata (short. spine)*	75(0.45)3	--	150(1.44)3
14	*K. valga*	1450(8.78)10	1150(9.42)10	1000(9.66)10
15	*Lecane elasma*	350(2.12)5	75(0.61)3	--
16	*Trileuchlanis plicata*	100(0.60)2	50(0.40)2	--
17	*Trichotria pocilluma*	75(0.45)3	50(0.40)1	--
18	*Mikrocodides sp*	75(0.45)3	--	125(1.20)4
19	*Monostyla bulla*	800(4.84)9	1100(9.01)10	1025(9.90)9
20	*M. closterocerca*	1625(9.84)10	950 (7.78)9	725(7.004)9
21	*Mytilinia ventralis*	25(0.15)1	--	--
22	*Notomata sp*	25(0.15)1	--	--
23	*Notholca acuminata*	1800(10.90)10	1175(9.63)11	1175(11.35)10
24	*Polyarthra dolicoptera*	1950(11.81)12	1275(10.45)10	1050(10.14)9
25	*Proalides verucosus*	50(0.30)1	25(0.20)1	--
26	*Rousseletia corniculata*	50(0.30)2	--	125(1.20)3
27	*Rotaria citrinus*	2100(12.72)12	1100(9.01)8	1150(11.11)10
28	*Synchaete oblonga*	75(0.45)2	25(0.20)1	--
	Total Rotifera	16500	12200	10350

(-) Means the absence of a species

In this study recorded the highest density of rotifera at station1 in September 2016 amounted to 2925 Ind./m^3 while the lower density was recorded in July 2016 at station 2 amounted to 375 Ind./m^3 (figure-2).

The high densities of rotifera recorded during the autumn months may be due to the favorable conditions and availability of abundant food in the form of bacteria, phytoplankton, and suspended detritus in the drainage canal water most rotifera are opportunists organisms respond very

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quickly to any change in the quality and quantity of food, and most of their genus like grow almost increased numerical linear with high food [20]This is consistent with the results of statistical analysis that showed a significant positive correlation of rotifera density with both nitrates and phosphates which is a major nutrients for the growth of phytoplankton, which constitute the main source of food to rotifer, in addition to the other environmental conditions of the drainage canal it a suitable for these organisms such as higher dissolved oxygen content that recorded at this season has helped in the growth and increase the density of rotifera because that rotifera is prefer to live in a high-oxygen environments[21] and this is in line with the results of statistical analysis, which recorded a significant positive correlation to rotifera with dissolved oxygen concentration and this is perhaps the main reason for low density Rotifera in the summer months, which recorded a low concentrations of dissolved oxygen, and high temperatures also this is consistent with the results of[22]showed to the presence of a negative relationship between temperature and rotifera density and the positive relationship with dissolved oxygen concentration as well as the high rotifera density in autumn may be due to high turbidity which influence on biotic factors affecting rotifer densities[23] The results of the present study concurred with the results of many previous Iraqi studies that recorded high densities of Rotifera in the autumn season , such as study Al-kraawi [24] in the Kuffa river and[25] in the Shamia river

In the present study were diagnosed about 28 taxonomic units table (2) when compared the number of this units with some previous local studiesthat conducted by [26]which record 36 taxonomic units of Rotifera in Al- Hashimia drainage canal in Babylon ,[27] that recorded 12 taxonomic units in the southern marshes of Iraq and [28] recorded 20 taxonomic units in Al- Gharraf River in Thi Qar province , the differences in the number of taxonomic units in the present study with previous studies returning to the nature of the environmental conditions in the region , the nature of the distribution of phytoplankton and the capacity of the size of the mesh network that control the quality and quantity of rotifera that is collected, as well as differences in taxonomic relating to non-diagnosis of some taxonomic orders to genus and species levels[29].

In the current study, the station (1) recorded higher number of species 28 species , station (2)18 species and station(3)17 species, the increase and decrease in the numbers of some species between the stations dependent on changes in temperatures, light permeability as well as other chemical factors such as salinity and the amount of dissolved oxygen and Ph[30] also[24]) reported that the abundance of rotifera species affected by number of factors, including the primary productivity, the depth of water, plant nutrient, predation and competition.

in the present study some rotifera genus appeared more of species such as *Keratella spp* which represented 4 species followed by Brachionus 3 species, Euchlanis and Monostyla 2 species(Table2).the most frequent Rotifera species during the study period are, *Brachionus calyciflorus (*long Spine**),***Euchlanis delatata, Keratella cochlearis, Monostyla closterocerca, Notholca acuminata, polyarthra dolicoptera, and Rotaria citrinus.* The appearance of this species during each months and every study stations as possible be attributed to the ability of these species to tolerance wide range of various environmental conditions which are also

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known to be also cosmopolites[31] while the remaining species, were appeared only at one station, which might be a result of unfavorable environmental conditions and over predation by fish larvae and aquatic invertebrates in these water bodies[32].

The first dominance *Rotaria citrinus*, species peaked in October 2015 with density 375 Ind./m^3 at station 1**,** while at stations 2 and 3, this species was observed in highest densities 275 Ind./$m^3$and 225 Ind./m^3 in September 2016 respectively(figure- 3).

The second dominance *polyarthra dolicoptera*, this species at station 1, peaked in April 2016 with density 325 Ind./m^3,at station 2, this species appeared with highest density 200 Ind./m^3 in March2016, at station 3, this species appeared with highest density 225 Ind./m^3in May2016 (figure - 4)

The third dominance *Notholca acuminata* at station1, this species peaked in May2016 with density 300 Ind./m^3,at stations 2 and 3, this species was observed in highest density 250 Ind./m^3 in September 2016(figure-5),

The four dominance *Monostyla closterocerca* at station 1, this species peaked in March2016 with density 350 Ind./m^3,at stations 2 and 3, this species was observed in highest densities 200 Ind./m^3 and 175 Ind./ m^3in May2016 and September2016 respectively(figure- 6)

The five dominance *Keratella cochlearis* at stations 1and 3, this species was observed in highest densities 325 Ind./m^3 and 175 Ind./m^3 respectively in September2016 ,at station 2 this species peaked in December 2015 with density 200 Ind./m^3(figure- 7) this species is pollution tolerant.

The six dominance spices was *Euchlanis delatata* observed in highest densities275 Ind./m^3,270 Ind./$m^3$and 200 Ind./m^3 respectively in September2016 ,at station 1,2,3 (figure- 8)

The seven dominance species *Brachionus calyciflorus* (long spine) was peaked with density 225 Ind./m^3 in September 2016 at station 2 and 175 Ind./m^3 at stations 1,3 in November2015 and September 2016 respectively (figure - 9).he Brachionus species are cosmopolitan with a broad distribution but very common in alkaline nature, temperate and tropical waters has ability to tolerate the pollution[33]as well as is a good indication for the eutrophication of water bodies[34]but [35] was considered Brachionus and Keratella species are inhabitants of moderately mesotrophic waters also Sudhir[36] reported the dominance of *Brachionus* in various freshwater ecosystems due to the species of this genus have a very wide range of morphological changes and adaptations. he species that record in the present study also recorded as abundant species in many of the previous Iraqi Studies such as study[37] in Al- Hilla River where it stated that specie *B. calyciflorus* appear superficial changes is an increase in the length of the shield and spines which defines polymorphism means the presence of more than one form of the same species and these changes are associated with changing environmental factors, particularly temperature, Nutrients, light, transparency and organic material in the water, study Rabee[12] which referred to the dominion of two species *Keratella Cochlearis* and *K. valga* in the upper region of Euphrates river – Iraq, study of[38] referred to dominion of two species *Brachionus calyciflorus* and *Keratella valga* in the Shatt Al-Arab river but *K.valga* have tow peaks of growth in summer and winter while *B.calyciflorus* usually has one peak of growth in the summer only, study [39] which referred to

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the presence of *Euchlanis* high density in the Tigris River and characterized of this species type presence in fresh, few salty and salt water environments and choose the growth between the aquatic plants, study Matlob [40],which refer to that species *Rotaria citrinus* is more density and frequent in the north part drainage canals of the main drainage channel as the large size of this species was exposed to predation by as larger of Copepoda and then change the densities monthly with change predators communities, the qualitative and quantitative dominion of this species may be due to several factors including this specie live in brackish and salt water environments, It belongs to a class *Bdelloidea* confirmed most environmental studies that most of its individuals have the ability to adapt and live in different environmental conditions because of parthenogenesis reproduction and the ability to enter into a state of life dormancy called Cryptobiosis in the critical environmental conditions, and dominion of specie *Notholca acuminata* where most of the increases in its density concentrated during the winter season and this specie wide spread in brackish water as well as species belonging of the genus Notholca dependent in their diet, in particular, the diatom algae This common and present in the Iraqi waters and the study of Al-Khalidy[13] which indicated to dominion *Polyarthra dolicoptera* in Al-Hilla drainage canal water in Babil-province , mild temperatures more suitable to the reproduction of this species , as well as the dominion *Monostylla closterocerca* that was wide spread globally and record in the waters of high salt reached a range between 12 -18g / l.

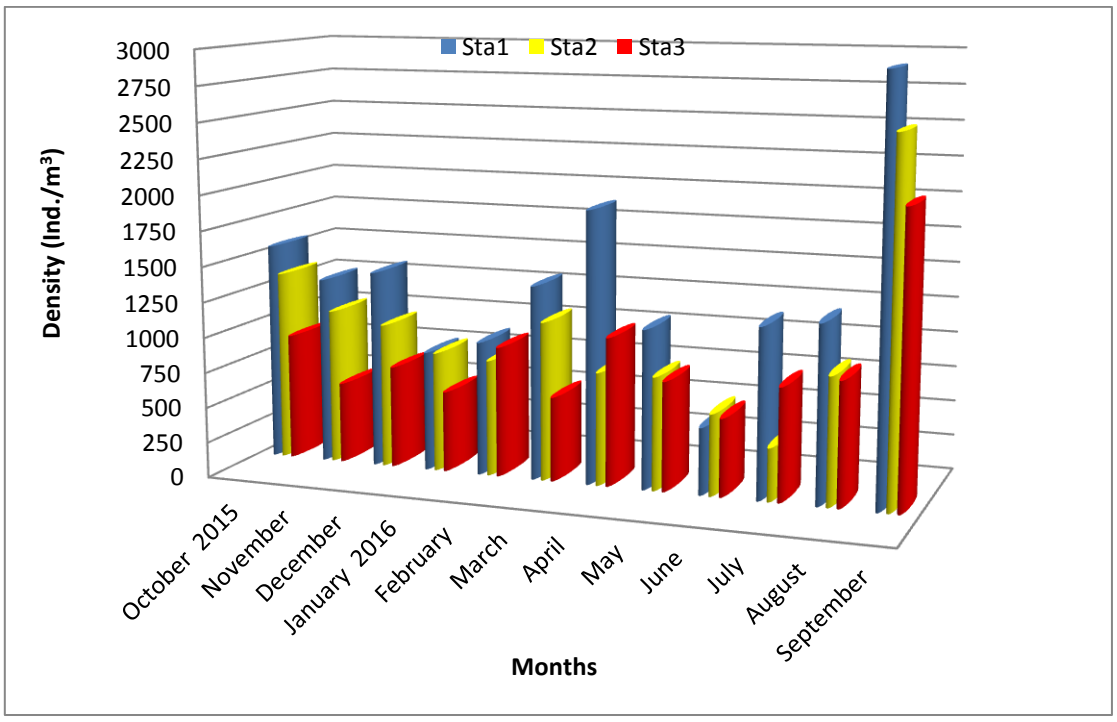

Figure 2: Monthly variation of total rotifer density

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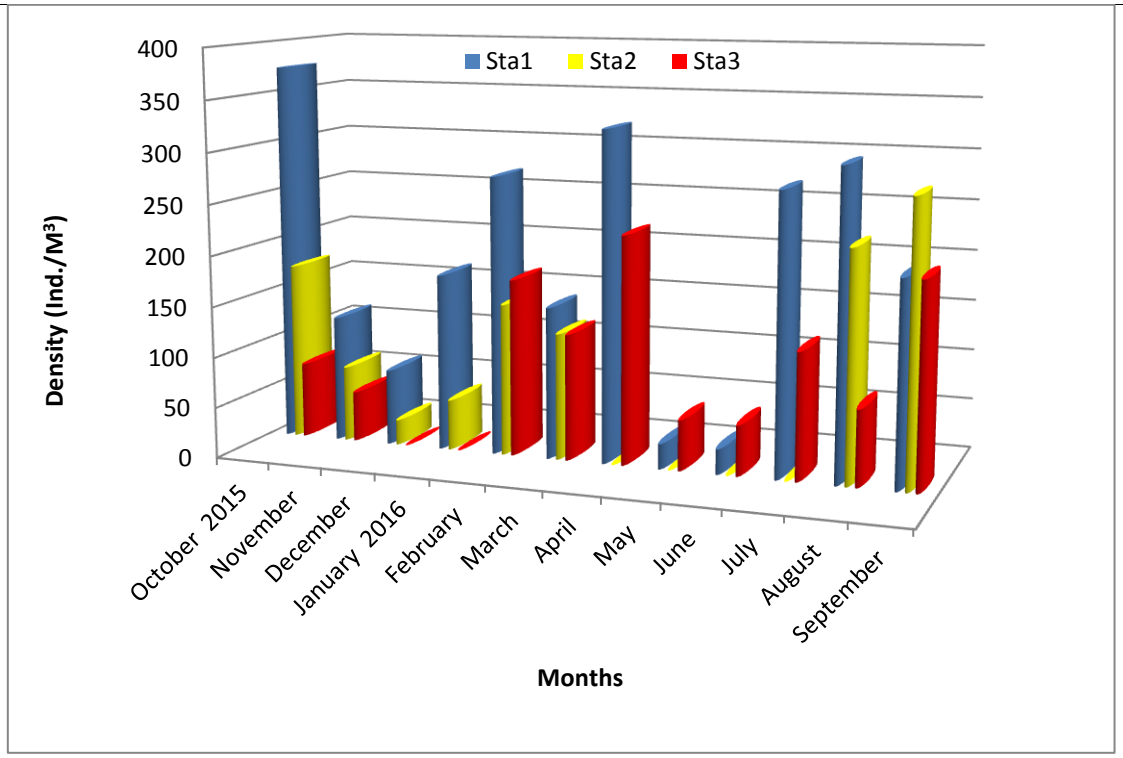

Figure 3: Monthly variation of *Rotaria citrinus* density

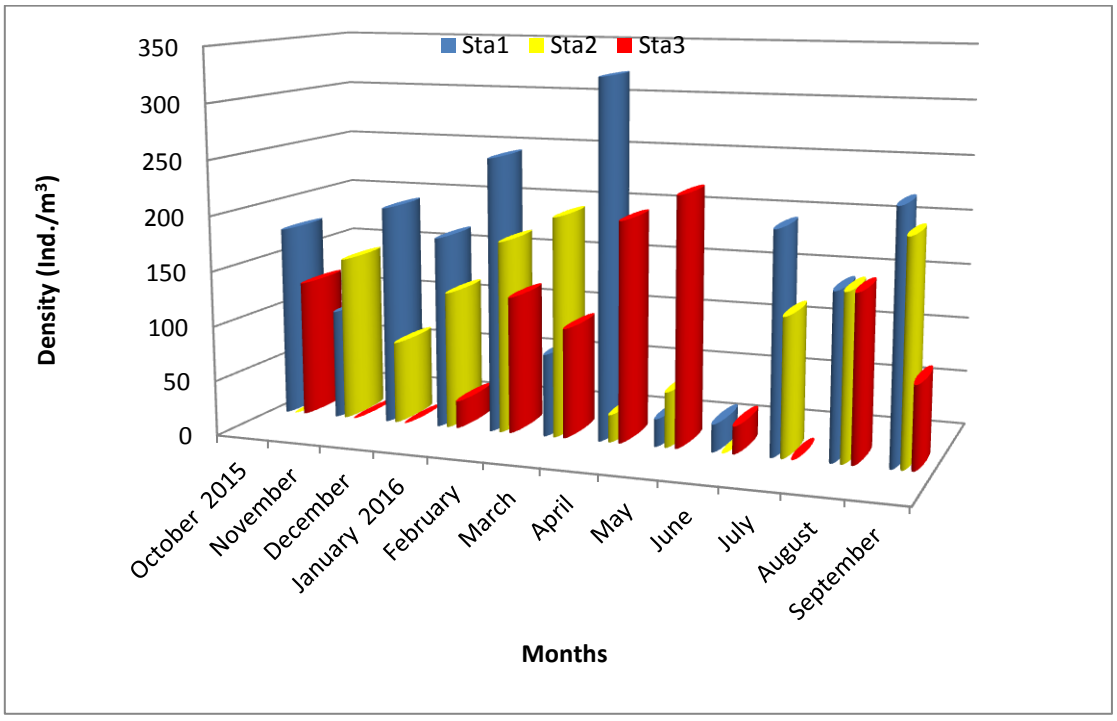

Figure 4: Monthly of *polyarthra dolicoptera* density

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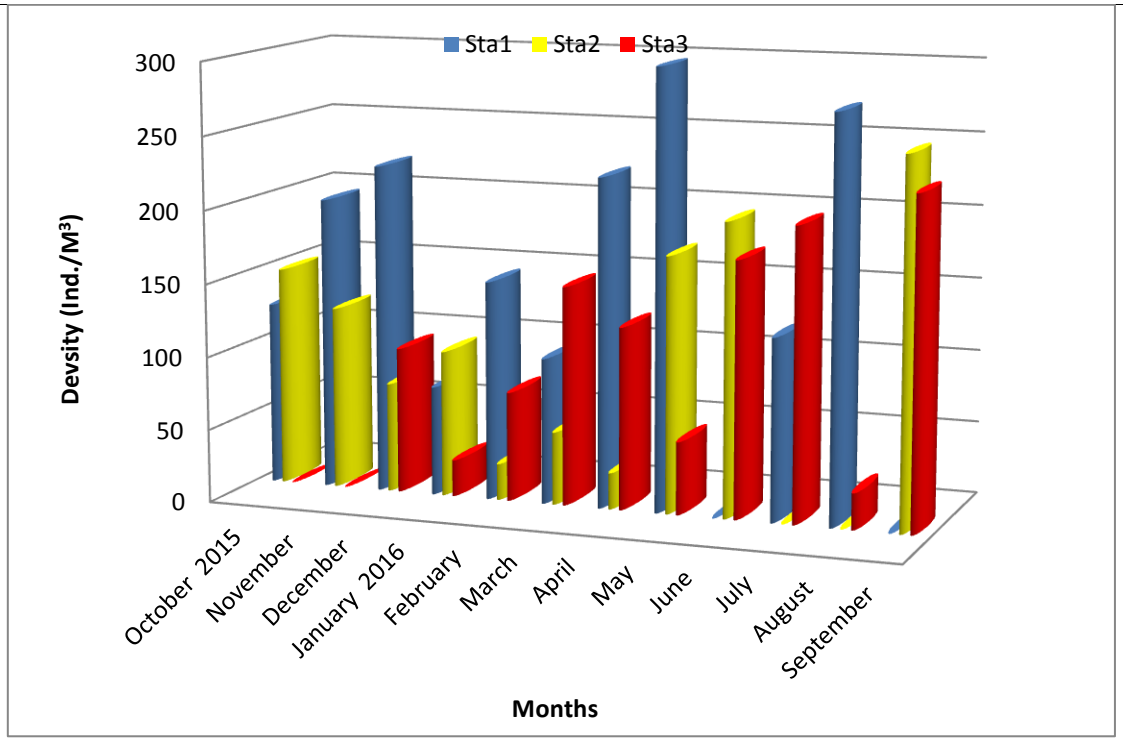

Figure 5: Monthly variation of *Notholca acuminata* density

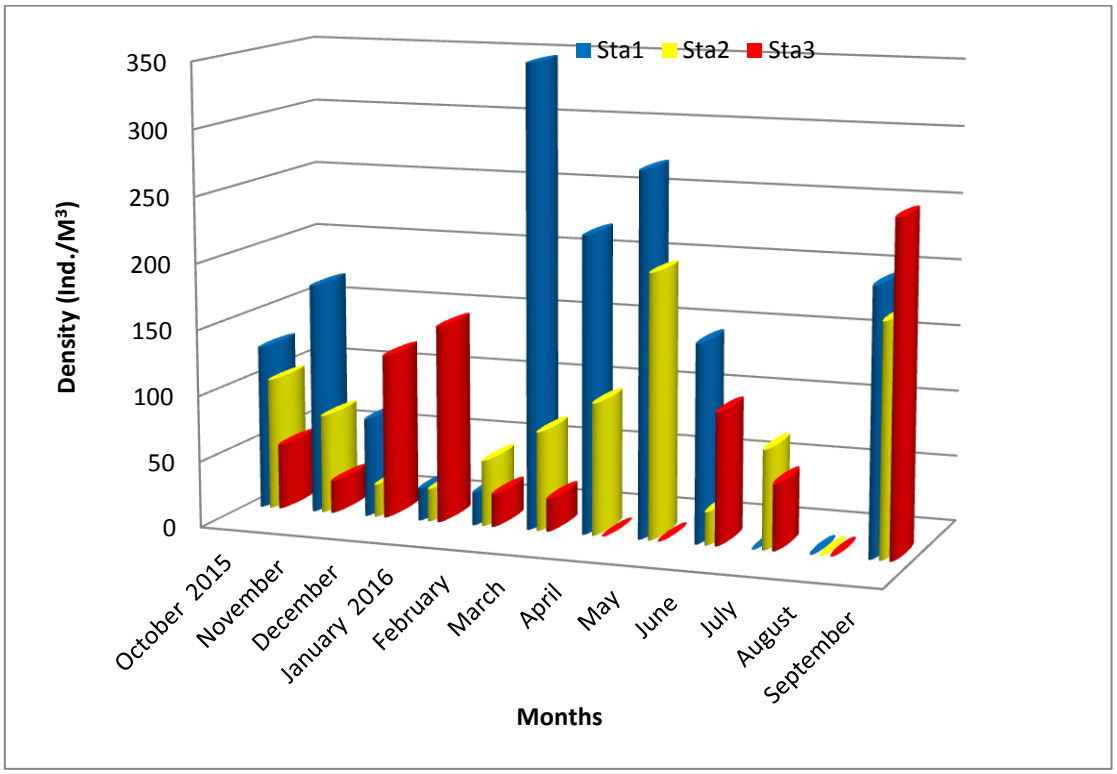

Figure-6: Monthly variation of *Monostyla closterocerca* density

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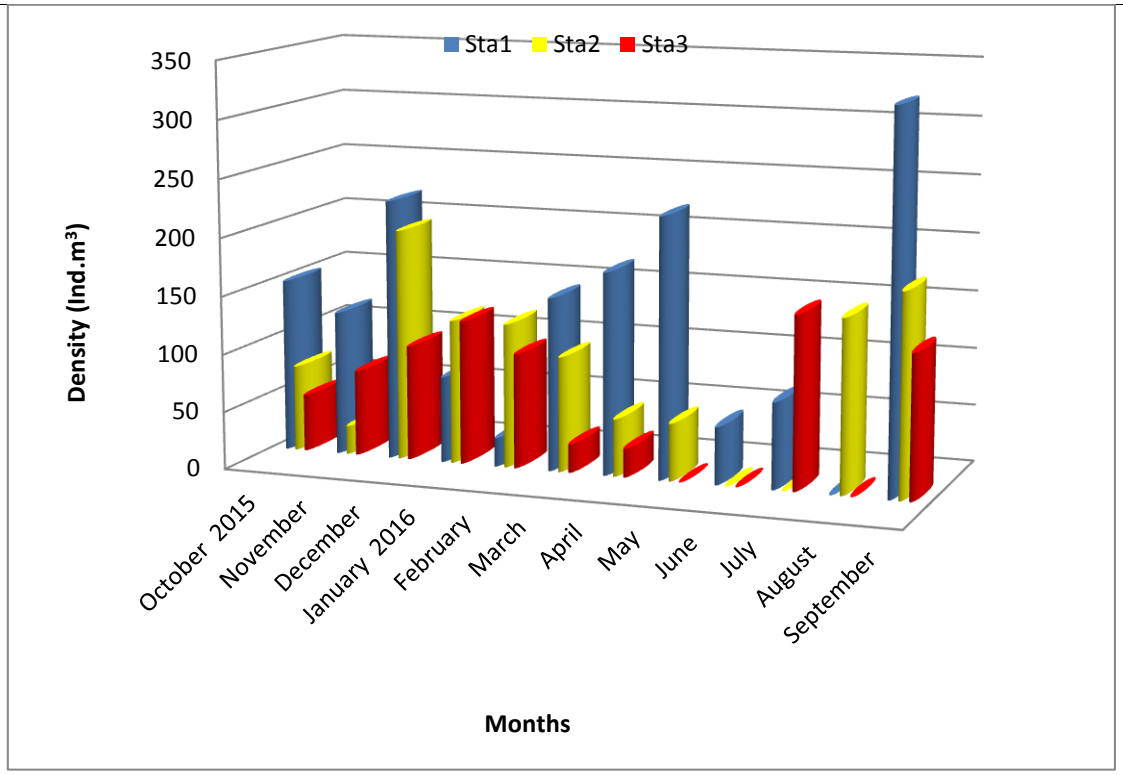

Figure 7: Monthly variation of *Keratella cochlearis* density

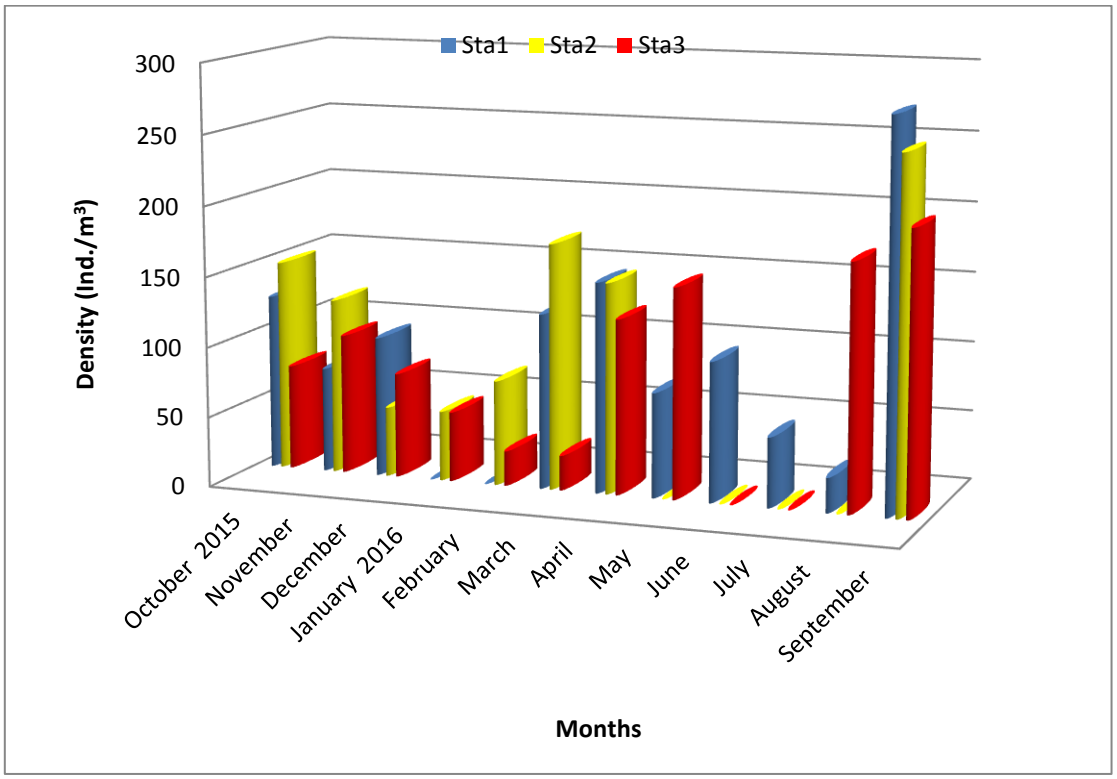

Figure 8: Monthly variation of *Euchlanis delatata* density

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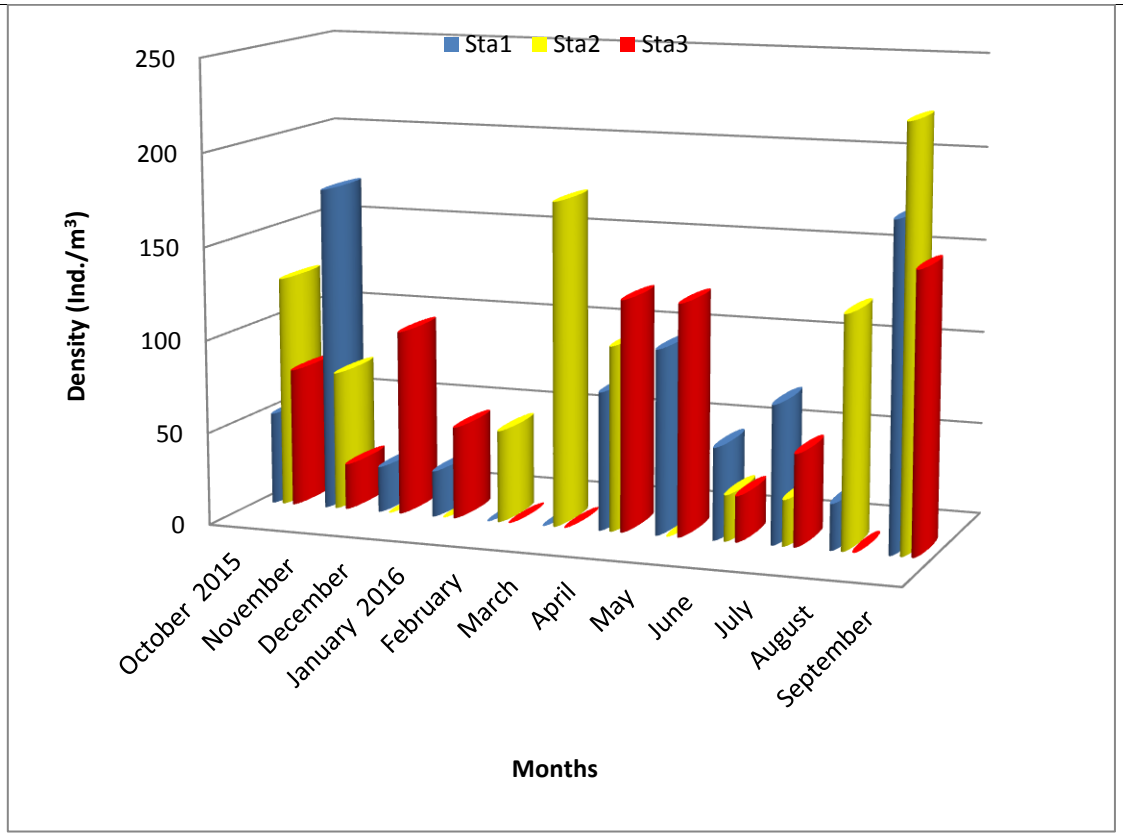

Figure 9: Monthly variation of *Brachionus calyciflorus* density

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