



## ROTIFERA OF THE AL- HILLA RIVER- IRAQ

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### ABSTRACT

This is the first study of Rotifera in the Al- Hilla river , which is passing through the city of Babylon – Iraq. Five stations were chosen for sampling which covered approximately 77 km from the river's length . The result showed that the density of Rotifera was varied from 2.27 ind. /L at station 5 in July and October 2011 to 14.56 ind./L at station 1 in March 2012 .About 128 rotifer taxa (108 species +19 genera + one class) were recorded in this study, 40 taxa were recorded for first time in Iraq (39 species + one genus). *K. cochlearis* showed the highest abundant (39%) of the rotifera , *Lecane* showed the highest species number (14 species).

**KEYWORDS:** Al- Hilla river , Rotifera ,checklist , distribution.

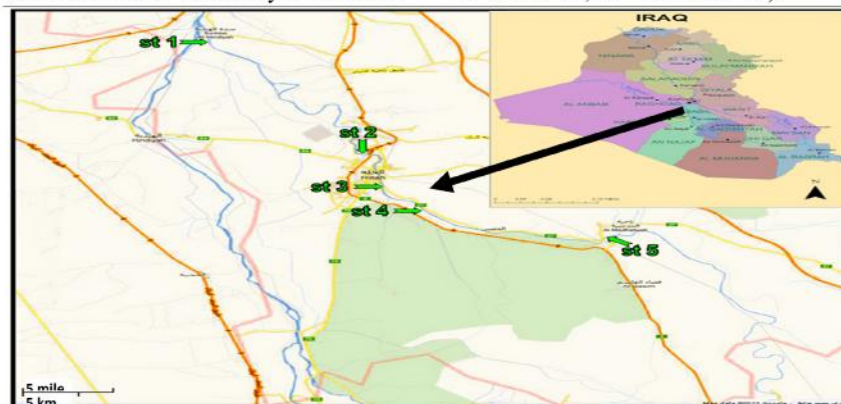
### INTRODUCTION

Rotifers are microscopic freshwater invertebrates , characterized by the presence of an anterior ciliated corona , a stiff body wall named lorica, and a specialized pharyngeal organ (trophi) .occurring in almost all types of freshwater habitat , they are filter-feeders, feeding on algae and bacteria . Rotifers are minute metazoans (50–2,000 μm), 2,000 species are presently recognized worldwide (Segers 2008). Rotifera play an important role in the food chain of aquatic environment system (Van der Stap *et al.*, 2007) .Various rotifer taxa serve as useful bioindicators of aquatic ecosystem (Duggan *et al.*, 2011) . Al-Hilla river is one of the notable inland rivers in Iraq; it is an important source of water for the cities of Babylon , Diwaniya , and Muthanna as it is used for different industrial, agricultural and commercial purposes and fisheries resources. There are many studies carried out on the Al-Hilla river focused on identifying the physical and chemical properties of its water and ecological studies. Moreover, there were many studies of the phytoplankton in the Al-Hilla river concerning the quality and quantity of phytoplankton and it's ecology (Hassan and AL-Saadi ,1995 ; Hassan , 1997 and Salman *et al.*, 2013 ).In Iraq , there were few studies focus on the taxonomy of Rotifera

in different water bodies (Al-Saboonchi *et al.*,1986 ; Mohammad , 1986 ; Sabri ,1988 ; Abdul-Hussein *et al.*, 1989 ; Sabri & Maulood, 1989 ; Mangalo *et al.*,1998 ; Al-Lami *et al.*,1999 ; Ali & Abdullah ,1999 ; Poltorak *et al.*, 2001; Ahmed *et al.*, 2005 and Hammadi , 2010 ). The aim of the present study is to identify the various species of Rotifera of Al-Hilla river with some notes on their distribution in the river . Such kind of investigation was not carried out before at this region.

### Study area

Al-Hilla River lies in the city of Babylon , it is branched out from Euphrates River, at Al-Hindiya dam . Its length 101 km . Five stations were selected along Al-Hilla River (Figure 1) which covered approximately 77 km from the river's length . Station 1: it is located in the Al-Hendia region after AL-Hendia dam, (44° 16' 36.63" E , 32° 42' 28.72" N). Station 2: in Sinjar region before Al-Hilla city center, near of the Beta bridge, (44° 25' 20.84" E , 32° 31' 01.93" N). Station 3: in Al-Farisy region after Al-Hilla city center, (44° 26' 26.76" E , 32° 28' 04.64" N). Station 4: in the Dora dam , after 7.83 km of station 3, (44° 29' 21.96" E , 32° 25' 02.06" N). Station 5: in the Al-Hashmia region , it is occurred at 19.45 km south of station 4 (44° 39' 21.83" E , 32° 22' 47.92" N).



**FIGURE 1 :** Maps of Al – Hilla river show the studied stations

**MATERIALS & METHODS**

Routine monthly sampling were carried out between April 2011 and March 2012 , from five stations. Samples were taken by vertical hauls with 50 µm mesh plankton net, and in the field specimens were fixed in 4% formalin immediately after sampling. Rotifers were identified according to the available standard keys (Koste, 1978 ; Koste & Shiel, 1980 ; Shiel, 1995; Nogrady & Pourriot ,1995 ; Wallace & Snell, 2001; Nogrady and Segers, 2002 ; Sanoamuang, 2002 ; Hammadi et al., 2012). A Sedgewick-Rafter slide's chamber was used to count the rotifers at 40× to 100× magnification with a light microscope (APHA, 2005). Jaccard's Index (Ss%) for the degree of similarity in species number between two stations was clustered by dendrogram showing similarity of Rotifera among stations (Jaccard ,1908).

**RESULTS & DISCUSSION**

This is the first study of rotifer's taxa in Al-Hilla river .The result showed ( Table 1 ) that there were 128 rotifer's taxa (108 species +19 genera + one class) belonging to 41 genera , 20 families , 4 orders , and 2 classes . There were recorded in the Al- Hilla river during April 2011 to March 2012 . This is the second highest records of Rotifer's taxa in Iraq after that of Hammadi (2010) in the Shat Al – Arab river . In this present study 40 taxa were recorded for first time in Iraq (39 species + one genus) (Table 1) . A list of 128 species or taxa of Rotifera collected at the 5 stations of Al-Hilla river are given in table 1, together with presence or absence of each taxon in every station . It is apparent that *Asplanchna priodonta* , *Bdelloidea* , *Brachionus angularis* , *Brachionus calyciflorus* , *Brachionus variabilis*, *Euchlanis dilatata*, *Filinia*

*opoliensis*, *Hexarthra mira*, *Keratella cochlearis*, *Keratella quadrata* , *Keratella tropica* , *Keratella valga*, *Polyarthra dolichoptera*, *Pompholyx sulcata*, and *Trichocerca rattus* are present through out 5 stations. However , certain species or taxon are specific to each station, *Asplanchna girodi*, *Cephalodella* sp., *Cephalodella reimanni*, *Cupelopagis vorax*, *Dicranophorus* sp., *Dipleuchlanis propatula*, *Euchlanis contorta*, *Hexarthra fennica*, *Keratella lenzi*, *Lecane braumi*, *Lecane lamellata*, *Macrochaetus sericus*, *Macrochaetus subquadratus*, *Paradicranophorus hudsoni*, *Plationus patulus*, *Ploesoma hudsoni*, *Synchaeta lakowitziana* , *Synchaeta lakowitziana*, *Trichocerca* sp., *Trichocerca agnatha*, and *Trichocerca elongata* were only reported at station 1. However , *Aspelta aper*, *Asplanchna brightwellii*, *Brachionus plicatilis* , *Cephalodella subsecunda*, *Dicranophorus prionacis*, *Harringtonia rousseleti*, *Hexarthra oxyuris*, *Keratella procurva*, *Lecane ludwigii*, *Pleurotrocha petromyzon*, and *Proales theodora* were only registered at station 2 . Where as , *Ascomorpha* sp. , *Brachionus budapestinensis*, *Colurella* sp., *Enicentrum porsildi*, *Lecane perpusilla*, *Macrotrachela angusta*, *Notommata* sp., *Notommata pseudocerberus*, *Paradicranophorus aculeatus*, *Trichocerca dixonnuttalli*, and other rotifers were reported at station 3 . Meanwhile , *Brachionus bennini*, *Filinia saltator*, *Lecane elsa* , *Lecane margarethae*, *Mytilina ventralis*, and *Trichotria pocillum*, were recorded at station 4. At station 5, However , *Aspelta* sp., *Keratella australis*, *Lecane hastate*, *Lecane nana*, *Lecane thienemanni*, *Lindia torulosa*, *Philodina* sp., *Resticula gelida*, *Taphrocampa* sp. , *Testudinella caeca*, and *Trichotria eukosmeta* were recorded.

**TABLE 1** : List of the taxa of Rotifera at five stations of the Al- Hilla river during April 2011 - March 2012.

Taxa	Station 1	Station 2	Station 3	Station 4	Station 5
1. <i>Anuraeopsis fissa</i> (Gosse ,1851)	+	+			
2. <i>Ascomorpha</i> sp.			+		
3. <i>Ascomorpha dumonti</i> De Smet ,1992. #			+	+	
4. <i>Aspelta</i> sp.					+
5. <i>Aspelta aper</i> (Harring, 1913). #		+			
6. <i>Asplanchna</i> sp.			+	+	
7. <i>Asplanchna brightwellii</i> Gosse, 1850. #		+			
8. <i>Asplanchna girodi</i> De Guerne, 1888. #	+				
9. <i>Asplanchna priodonta</i> Gosse, 1850	+	+	++	+	+
10. <i>Bdelloidea</i>	+	+	+	+	+
11. <i>Brachionus</i> spp.				+	+
12. <i>Brachionus angularis</i> Gosse ,1851	+	+	+	+	+
13. <i>Brachionus bennini</i> Leissling ,1924. #				++	
14. <i>Brachionus budapestinensis</i> Daday, 1885			+++		
15. <i>Brachionus calyciflorus</i> Pallas, 1766	+	++	+	+	+
16. <i>Brachionus diversicornis</i> ( Daday,1883 ). #	+				+
17. <i>Brachionus falcatus</i> Zacharias, 1898		+	+		
18. <i>Brachionus plicatilis</i> Müller, 1786		+			
19. <i>Brachionus quadridentatus</i> Hermann, 1783	+	+	+		+

20.	<i>Brachionus rubens</i> Ehrenberg, 1838	+	+			+
21.	<i>Brachionus variabilis</i> Hempel, 1896	+	+	+	++	++
22.	<i>Cephalodella</i> sp.	+				
23.	<i>Cephalodella gibba</i> (Ehrenberg, 1832)	+	+	+		+
24.	<i>Cephalodella reimanni</i> Donner, 1950	+				
25.	<i>Cephalodella subsecunda</i> Myers, 1924 . #		+			
26.	<i>Collotheca</i> sp.		+			+
27.	<i>Colurella</i> sp.			+		
28.	<i>Colurella adriatica</i> Ehrenberg, 1831			+	+	
29.	<i>Colurella colurus</i> ( Ehrenberg, 1830 )	+		+	++	+
30.	<i>Colurella obtusa</i> (Gosse, 1886)		+			+
31.	<i>Cupelopagis vorax</i> (Leidy, 1857)	+				
32.	<i>Dicranophorus</i> sp.	+				
33.	<i>Dicranophorus prionacis</i> Harring & Myers, 1928. #		+			
34.	<i>Dipleuchlanis propatula</i> ( Gosse 1886 )	+				
35.	<i>Encentrum porsildi</i> Sørensen, 1998 . #			+		
36.	<i>Encentrum</i> sp.	+			+	
37.	<i>Euchlanis contorta</i> ( Wulfert, 1939 ). #	+				
38.	<i>Euchlanis deflexa</i> ( Gosse 1851 )	+				+
39.	<i>Euchlanis dilatata</i> Ehrenberg, 1832	+	+	+	+	+
40.	<i>Euchlanis lyra</i> Hudson, 1886	+			+	+
41.	<i>Filinia</i> spp.		+	+		
42.	<i>Filinia longiseta</i> (Ehrenberg, 1834)	+		+		
43.	<i>Filinia opoliensis</i> ( Zacharias, 1898 )	+	+	+	+	+
44.	<i>Filinia terminalis</i> ( Plate ,1886 )				+	+
45.	<i>Filinia saltator</i> ( Gosse ,1886 )				+	
46.	<i>Harringia rousseleti</i> Beauchamp , 1912. #		+			
47.	<i>Hexarthra</i> sp.	+	+			+
48.	<i>Hexarthra fennica</i> (Levander, 1892)	+				
49.	<i>Hexarthra intermedia</i> (Wiszniewski, 1929) . #		++		+	
50.	<i>Hexarthra mira</i> ( Hudson, 1871 )	+	+	+	+	+
51.	<i>Hexarthra oxyuris</i> (Sernov, 1903)		+			
52.	<i>Keratella</i> spp.	+	+	+		
53.	<i>Keratella australis</i> Berzins, 1963. #					+
54.	<i>Keratella cochlearis</i> ( Gosse, 1851 )	+++	+++	++	++	++
55.	<i>Keratella lenzi</i> ( Hauer, 1953 ). #	+				
56.	<i>Keratella procurva</i> ( Thorpe, 1912 )		+			
57.	<i>Keratella quadrata</i> ( Müller, 1786 )	+	+	+	+	+
58.	<i>Keratella tecta</i> (Gosse, 1851)	+	+	+		+
59.	<i>Keratella testudo</i> ( Ehrenberg, 1832 )	+			+	
60.	<i>Keratella tropica</i> ( Apstein, 1907 )	+	++	+	+	+
61.	<i>Keratella valga</i> (Ehrenberg, 1834)	+	+	+	+	+
62.	<i>Lecane</i> spp.	+				+
63.	<i>Lecane braumi</i> Koste, 1988 . #	+				
64.	<i>Lecane bulla</i> (Gosse, 1851)	+	+	+		+
65.	<i>Lecane closterocerca</i> (Schmarda, 1859)	+		+	+	+
66.	<i>Lecane curvicornis</i> (Murray, 1913). #			+	+	
67.	<i>Lecane elsa</i> Hauer, 1931. #				+	
68.	<i>Lecane hamata</i> (Stokes, 1896)	+		+		
69.	<i>Lecane hastata</i> (Murray, 1913) . #					+
70.	<i>Lecane lamellata</i> (Daday, 1893). #	+				
71.	<i>Lecane ludwigii</i> (Eckstein, 1883)		+			

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72.	<i>Lecane luna</i> (Müller, 1776)	+	+		+	+
73.	<i>Lecane lunaris</i> (Ehrenberg, 1832)	+			+	+
74.	<i>Lecane margarethae</i> Segers, 1991. #				+	
75.	<i>Lecane nana</i> (Murray, 1913). #					+
76.	<i>Lecane perpusilla</i> (Hauer, 1929) . #			+		
77.	<i>Lecane stenroosi</i> (Meissner, 1908)	+			+	+
78.	<i>Lecane thienemanni</i> (Hauer, 1938)					+
79.	<i>Lepadella ovalis</i> (Müller, 1786)		+	+		
80.	<i>Lepadella patella</i> (Müller, 1773)		+			+
81.	<i>Lindia torulosa</i> Dujardin , 1841. #					+
82.	<i>Macrochaetus sericus</i> (Thorpe, 1893). #	+				
83.	<i>Macrochaetus subquadratus</i> (Perty, 1850)	+				
84.	<i>Macrotrachela angusta</i> (Bryce 1894) #			+		
85.	<i>Mytilina ventralis</i> (Ehrenberg, 1830) . #				+	
86.	<i>Notholca acuminata</i> (Ehrenberg 1832)	+	+	+	+	
87.	<i>Notholca squamula</i> (Müller, 1786)	+	+			+
88.	<i>Notommata</i> sp.			+		
89.	<i>Notommata copeus</i> Ehrenberg, 1834		+		+	
90.	<i>Notommata pseudocerberus</i> de Beauchamp, 1907. #			+		
91.	<i>Paradicranophorus aculeatus</i> (Neiswestnova - Shadina, 1935) . #			+		
92.	<i>Paradicranophorus hudsoni</i> (Glascott, 1893). #	+				
93.	<i>Philodina</i> sp.					+
94.	<i>Plationus patulus</i> (Müller, 1786)	+				
95.	<i>Platylas quadricornis</i> (Ehrenberg, 1832)	+			+	
96.	<i>Pleurotrocha petromyzon</i> ( Ehrenberg , 1830 ). #		+			
97.	<i>Ploesoma hudsoni</i> (Imhof, 1891). #	+				
98.	<i>Polyarthra dolichoptera</i> Idelson, 1925	++	++	++	+++	++
99.	<i>Polyarthra longiremis</i> Carlin, 1943. #	+	++	+		+
100.	<i>Polyarthra major</i> Burckhardt, 1900		++			+
101.	<i>Polyarthra remata</i> Skorikov, 1896	++	++	++	++	
102.	<i>Polyarthra vulgaris</i> Carlin, 1943		+			+
103.	<i>Pompholyx complanata</i> Gosse, 1851 . #	+	+	+		+
104.	<i>Pompholyx sulcata</i> (Hudson, 1885)	++	+	+	+	+
105.	<i>Proales</i> sp.					+
106.	<i>Proales theodora</i> (Gosse, 1887). #		+			
107.	<i>Resticula gelida</i> Harring and Myers, 1922. #					+
108.	<i>Rotaria neptunia</i> (Ehrenberg, 1830)	+	+	+		
109.	<i>Synchaeta</i> spp.	+	+		+	
110.	<i>Synchaeta lakowitziana</i> Lucks, 1930	+				
111.	<i>Synchaeta oblonga</i> Ehrenberg, 1832	+	+	+		
112.	<i>Synchaeta pectinata</i> Ehrenberg, 1832	+	+			
113.	<i>Taphrocampa</i> sp. #					+
114.	<i>Testudinella caeca</i> (Parsons, 1892). #					+
115.	<i>Testudinella patina</i> (Hermann, 1783)	+	+		+	
116.	<i>Testudinella reflexa</i> (Gosse, 1887). #		+		+	+
117.	<i>Trichocerca</i> sp.	+				
118.	<i>Trichocerca agnatha</i> Wulfert, 1939	+				
119.	<i>Trichocerca dixonnuttalli</i> (Jennings, 1903)			+		
120.	<i>Trichocerca elongata</i> (Gosse, 1886)	+				
121.	<i>Trichocerca porcellus</i> (Gosse, 1851)	+		+		+
122.	<i>Trichocerca pusilla</i> (Lauterborn, 1898)		+		+	
123.	<i>Trichocerca rattus</i> (Müller, 1776)	++	++	++	++	+
124.	<i>Trichocerca similis</i> (Wierzejski, 1893)	+		+		

125.	<i>Trichotria eukosmeta</i> Myers, 1934 . #					+
126.	<i>Trichotria pocillum</i> (Müller, 1776)					+
127.	<i>Trichotria tetractis</i> (Ehrenberg, 1830)	+	+	+		+
128.	<i>Trichotria truncata</i> (Whitelegge, 1889)	+	+			
129.	other rotifers				+	
Number of rotiferan taxa at each station		71	59	50	45	54

Number of rotiferan taxa in this list : 128

Number of new records to Iraq (#) : 40

+: <1 ind./L  
 ++: 1 – 2 ind./L  
 +++: > 2 ind./L

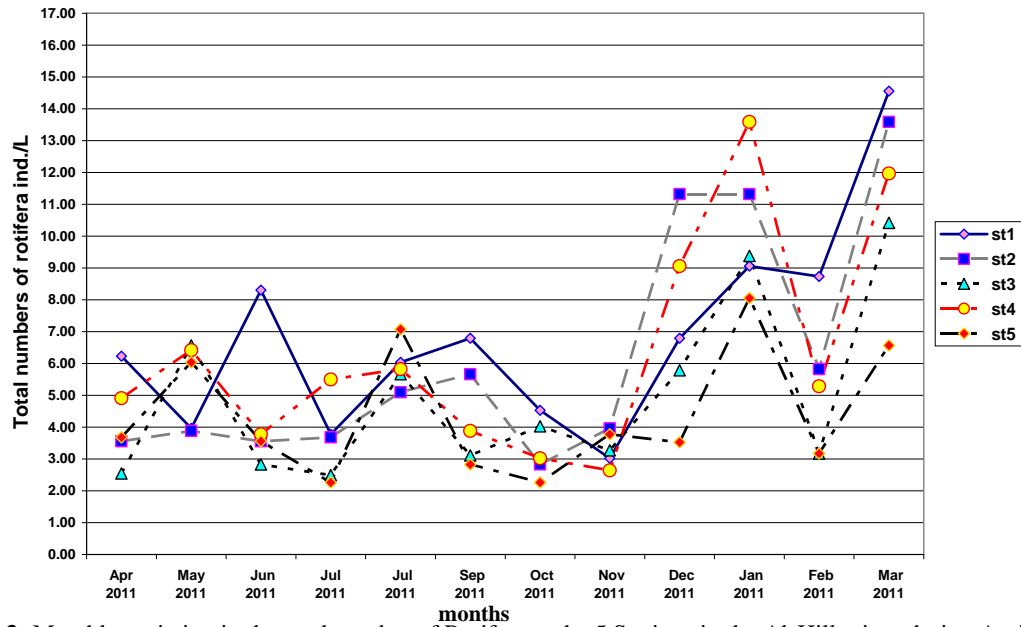


FIGURE 3: Monthly variation in the total number of Rotifera at the 5 Stations in the Al-Hilla river during April 2011 – March 2012

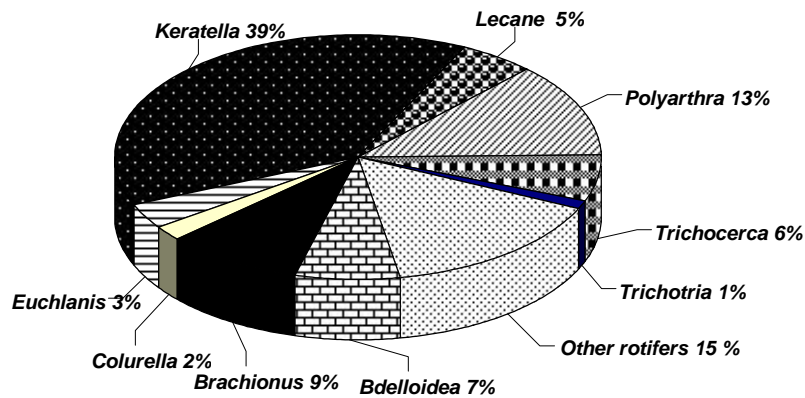
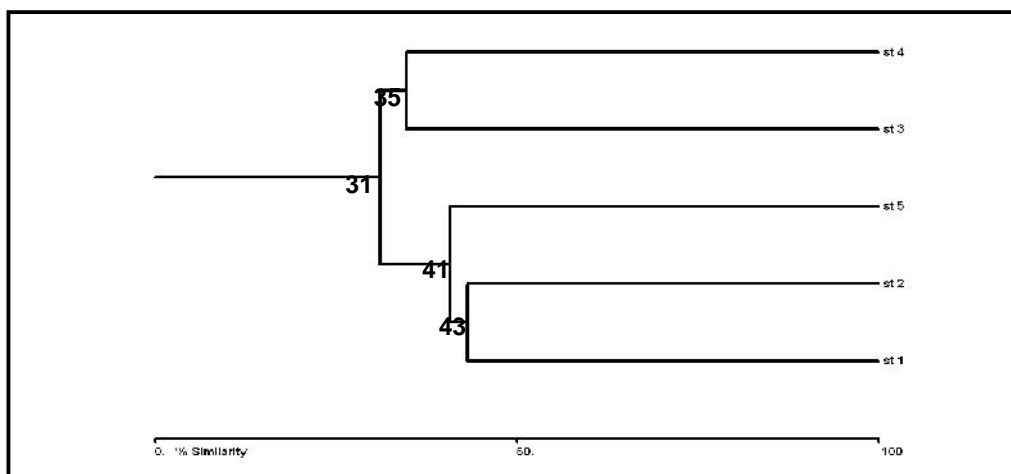


FIGURE 4: The percentage of total density of some rotifers during April 2011 - March 2012 for the five study stations of Al-Hilla River



**FIGURE 5.** Dendrogram based on Jaccard's similarity index of Rotifera at the five stations of Al-Hilla River during April 2011 - March 2012

Station 1 showed the highest number of taxa of Rotifera (71) (Table 1), Rotifers density fluctuate between 2.27 ind./L at station 5 in July and October 2011 and 14.56 ind./L at station 1 in March 2012. The present study, demonstrates that the population density of Rotifera at Al-Hilla river increased during the end of winter and beginning of spring (Figure 2). The highest average density of *K. cochlearis* (5.77 ind./L) was recorded in March 2012, forming 39% of the density of Rotifera (Figure 3). This is consistent with the result of Rabee (2010) on the rotifers at Euphrates River and Al-Tharthar-Euphrates canal, *K. cochlearis* was found in nearly every sample, as it is a cosmopolitan species (Koste, 1978). This species is probably the most common representative of Metazoa on earth (Kuczy ska-Kippen, 2008). The genus *Lecane* was represented by 14 which is the highest species number (Table 1). *Lecane* is one of most species-rich of Rotifera and it is constitute a group of common fresh water and sline Rotifera (Pejler and Berzins, 1994). Figure 5 showed the results of Jaccard's similarity index. The highest similarity value (43%) was between stations 1 and 2, both these two stations are located before Babylon city center, in the other hand, stations 3 and 4 showed similarity value (35%) and they are located after the city center. The tow stations are exposed to heavy waste and sewage loads carried by the river after passing the city center.

### CONCLUSION

We concluded that Al-Hilla river contains many rotifer's species (128 species reported in the present study), 40 taxa were recorded for first time in Iraq. *K. cochlearis* showed the highest density, *Lecane* represented by the highest species number. Also result indicated the obvious effect of the city center pollutants on the river's fauna of Rotifera.

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