



## Description study of Rotifera (Cunier 1798) from wetland areas in the middle of Iraq

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### Abstract

The current study revealed to three genus of Rotifera: *Branchionus*, *Euchlanis* and *Philodina* that belong to two classes Monogonata and Bdelloidea that distributed among six wetland areas: Area 1(Al Zawraa Lake in Al Zawraa Park in Baghdad city), Area 2 (Hi Al Abaas, Road of Karbala, Baghdad, Karbala main drainage), Area 3 (Al Rawdatain, Karbala Al Hurr Tourist Road, Al Hussenia River), Area 4 (Al Jamalia, Baghdad Al Hurr Road, Karbala main drainage), Area 5 (Al Jamalia, Al Hurr Road, Al Hurr area, the intersection of Al Jamalia, Al Hussenia River), and Area 6 (Intersection of Al - Hurr Road Baghdad, Al Hussenia River). The results aimed to variations in population of Rotifers that may be due to variation in type of water. Each genus was studied its morphological description, some of its biological aspects and its prevalence compared with previous studies in Iraq.

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## Introduction

A rotifer as part of Microzooplankton, play a very important role in the production ecology of the aquatic ecosystem, and they are an important part of the fresh water zooplankton, being a major food source and with many species also contributing to the decomposition of soil organic matter (Beers *et al.*, 1980). Rotifera means "Wheeled animals" appear to have wheels rotating about the tops of their heads under a microscope, (Segers, 2002, 2004). Phylum of Rotifera is divided into two classes, the Digononta and the Monogononta. The members of the class Monogononta constitute 90% of the known species; they have a species-specific trophus, Rotifer body possess three main features: a ciliated anterior end, called the corona; Jaws, called trophi; and a thickened body wall, called the lorica (Wallace *et al.*, 2006) hence the identification of rotifers depends on the characteristics of the lorica, corona, and mastax (trophi) for plankton specimens. Rotifera have the highest breeding rate compared to all other multicellular types (Nogrady *et al.*, 1993). The density of rotifera can increase if food and appropriate conditions to hit to 24,000 individuals per liter (Shiel *et al.*, 1987). These are few compared with 500,000 individuals per liter, which is recorded in the water of a sewage system (Lubzens, 1987), despite these high densities, "1000 individuals" per liter.

It should be noted that the studies on a few wetlands in Iraq, including the study Sabri (1988) Rotifera in river Tigris, Sabri *et al.* (1989) studied the faunal composition of rotifera species in Tigris; Studied Mangalo *et al.* (1998) on the States in the Lake Qadisiyah Dam in northwestern Iraq, and study Al-Lami *et al.* (1999) of the Euphrates River States. Ali and Abdulla (1999) investigated the relationship between the rotifers biomass and the phytoplankton, and the study of Poltorak *et al.* (2001) of the states of Lake Tharthar, Habbaniya and Razzaza.

Then, the study of Ahmed *et al.* (2005) of the States of the Gulf States in the Shatt al-Arab, and the study of Ibrahim, (2005) of the Daghara and Diwaniya rivers. Ahmed and Mohamed, (2006) studied the Rotifera

community in three marshes (Basrah, Amara and Nasiria). Rabee (2007) studied the biological diversity of the mammals in the Upper Euphrates. Ghazi & Ahmed, (2008) studied geopolitics in the region of Kerma Ali, and studied Rabee, (2010) the types of the statesmen in the channel Tharthar and the Euphrates River. Hammadi, (2010) revealed to an Ecological Study of the Rotifera of Shatt Al-Arab region.

The aim of current study to determine, first: the diversity of rotifers in the selected six wetland areas in middle of Iraq for the first time to complete the biodiversity of Rotifera in all wetland in Iraq. Second: the description, the distribution and the living aspect for each one.

## Material and methods

A total of 180 water samples was collected from the six areas mentioned in table (1). 30 samples from each one in a clean and sterilized bottle from March to October 2018. The samples were labeled with name of area and the date of collection, and were transported to the Iraq Natural History Research Center and Museum, University of Baghdad for testing. Compound microscope was used for examination of the Rotifera. Description and identification of the species are based on Edmonson, 1959 and Pennak, 1989.

Photographs, measurements and description of the most species obtained from studied areas.

### Study area

Samples were collected from six areas for the first time which have different types of water (table 1).

## Results and discussion

The current study revealed to three genus of Rotifera: *Branchionus*, *Euchlanis* and *Philodina* that belong to two classes Monogonata and Bdelloidea that distributed among six wetland areas. Area 1, Area 2 and Area 4 recorded three genus of Rotifera, while Area 3, Area 5, and Area 6 recorded variation of the genus as in Table1. These variations in results may be due to variation in type of water.

**Table 1.** Studied Areas with description of their types of water.

Studied Areas	Sites	Types of water
Area 1	Al Zawraa Lake in Al Zawraa Park in Baghdad city.	Still water, contaminated with organic matter, A confined lake.
Area 2	Hi Al Abaas, Road of Karbala, Baghdad, Karbala main drainage.	Still water, contaminated with Wastewater, for watering green belts and orchards.
Area 3	Al Rawdatain, Karbala Al Hurr Tourist Road, Al Hussenia River.	Running water, coming from Euphrates River using for drinking water filter stations.
Area 4	Al Jamalia, Baghdad Al Hurr Road, Karbala main drainage.	Still water, contaminated with Wastewater, for watering green belts and orchards.
Area 5	Al Jamalia, Al Hurr Road, Al Hurr area, the intersection of Al Jamalia, Al Hussenia River.	Running water, coming from Euphrates River using for drinking water filter stations.
Area 6	Intersection of Al - Hurr Road Baghdad, Al Hussenia River.	Running water, Running water, coming from Euphrates River using for drinking water filter stations.

**Table 2.** Distribution of the Rotifera taxa at six areas of wetland in the middle of Iraq.

Rotifera taxa	Class	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
<i>Brachionus</i> sp.	Monogonata	+ve	+ve	+ve	+ve	+ve	+ve
<i>Euchlanis</i> sp.	Monogonata	+ve	+ve	-ve	+ve	-ve	-ve
<i>Philodina</i> sp	Bdelloidea	+ve	+ve	-ve	+ve	-ve	-ve

*Description of Brachionus sp.*

*Scientific name*

Kingdom: Animalia

Class: Monogononta

Order: Plioma

Family: Brachionidae

Genus: *Brachionus* (Pallas, 1766)

*Morphology*

Morphologically in general, rotifers have two main features: corona and mastax. The apical end (head) is called the corona (wheel organ); it is used for locomotion and food gathering (Telesh *et al.*, 2009).

*Brachionus* sp. has distinct cilia, a wide oral cavity and a muscular pharynx (the mastax), possessing a complex set of hard jaws called trophi. The ocular spot represents the eye and is clearly present, muscles is longitudinal in both sides, flame blub is behind dorsal antenna, gastric gland is rounded, stomach is brownish area in the middle of the body. Yolk sac in the dorsal third of the female body and there is single oval egg. The Lorica of this genus is soft and

transparent, and there is contractile vesicle in front of the anus. There is a long pedal gland that end with double toes or single according to the species of this genus fig. 1. This genus was described by Telesh & Heerkloss, (2002).



**Fig. 1.** Description of *Brachionus* sp. from fresh water, 10X. CC- coronal cilia, BR- brain, EYE- Eye, DA- dorsal antenna, M- muscle, FB- flame blub, GG- gastric gland, LA- lateral antenna, ST- stomach, YG- yolk sac, L- lorica, I- intestine, CV- contractile vesicle, A- anus position, PG- pedal gland, T- toes, EGG- egg.

### *Distribution and living aspect*

Genus *Brachionus* is thermophile that grows best at higher than normal temperatures and euryhaline inhabits mainly shallow waters, brackish, salt water and pools. All species feed on algae and partly- on bacteria, food species lists have not been reported, (Telesh & Heerkloss, 2002). Members of the genus are easy to cultivate (Kostopoulou *et al.*, 2006), and consequently more is known about their life span, propagation and reproduction than most species of other genera of Rotifera (Ruttner-Kolisko, 1974).

The current study revealed to the genus *Brachionus* showed higher diverse than the rest in all the studied area, this finding is similar to Ahmed and Mohammed, (2006) whom recorded that the species *Brachionus urceolaris* was the most occurrences and abundance in all stations of the south Marshes of Iraq. Then Ghazi and Ahmed, (2008) recorded five species of the genus *Brachionus* in the Garmat Ali Region Ponds, Basrah-Iraq. Then, six species of the genus *Brachionus* were recorded by Ahmed and Ghazi, (2009) in Al-Hammer marsh, south of Iraq; and then, four species of the same genus were recorded by Ahmed and Ghazi, (2014) in Shatt Al-Arab River and Shatt Al Basrah canal, South of Iraq.

In Al- Hilla River, Abd Al-Rezzaq *et al.* (2014) recorded three species: *Brachionus angularis*, *Brachionus diversiconis*, *Brachionus calyciflorus*.

In Al – Kufa River, Muhanned *et. al.*, (2016), who recorded eleven species of *Brachionus* that: *Brachionus angularis*, *B. bidentatus*, *B. calyciflorus amphicerus* (long spin), *B. calyciflorus amphicerus* (short spin), *B. calyciflorus calyciflorus*, *B. falcatus*, *B. haranansis*, *B. quadridentaths*, *B. rubens*, *B. urceolaris*, *B. zahniseri*. In the same year, Thijar *et al.*, (2016) recorded eight species in Tigris River in Baghdad city; and Hammadi, (2016) also recorded eight species in the 14 sites in the middle of Iraq.

Recently, Ali and Latef, (2017) recorded three species for the genus *Brachionus* in Lesser Zab River in Kurdistan north of Iraq; And Khalid, (2017) recorded

eight species of *Brachionus* in three stations (north, middle and south) on Tigris River in Baghdad city.

Our findings are complementary to the results of previous studies but in other new study areas this is important for biodiversity.

### *Description of Euchlanis sp.*

#### *Scientific name*

Kingdom: Animalia

Phylum: Rotifea

Class: Monogononta

Order: Plioma

Family: Euchlanidae

Genus: *Euchlanis* (Ehrenberg, 1832)

Synonym *Dapidia* (Gosse, 1887)

#### *Morphology*

There are visible pair of bundle long muscles on the sides that aid the rotifera to contract the ciliated crown. Stomach is a huge ball in the middle of body; the white structures on each side are gastric gland. The wavy tubes alongside are used to rid of waste products. Flame cells are current that drains to a bladder or intestines; the bladder is situated near the tail (Fig. 2).



**Fig. 3.** Description of *Euchlanis* sp. from fresh water.10X, a. Ciliated crown, b. Eyespot, c. wavy tubes, d. Gastric glands, e. Stomach, f. Flame cells, g. Bladder, h. Tail.

*Distribution and living aspect*

The result of current study revealed to distribution of *Euchlanis* sp. in area 1, area 2 and area 4 from studied areas and others were negative; All three areas are similar in type of water which Still and contaminated water; This agrees with Wallace, (1987) who aimed to some species of Rotifera that live permanently attached to plants in Still water and called sessile rotifers.

In Iraq, one species of *Euchlanis* was recorded by Ghazi and Ahmed, (2008) in the Garmat Ali Region Ponds, Basrah; four species *Euchlanis contorta*, *E. deflexa*, *E. dilatata* and *E. lyra* were recorded in Al Hilla River by Abd Al-Rezzaq *et al.* (2014); and one species *Euchlanis* sp. was recorded by Ahmed and Ghazi, (2014) in Shatt Al-Arab River and Shatt Al Basrah canal, South of Iraq.

One species *E. dilatata* was recorded by Muhanned *et al.*, (2016) and Hammadi, (2016); Three species *E. dilatata*, *E. deflexa* and *Euchlanis* sp. were recorded by Thijar *et al.*, (2016) in Tigris River in Baghdad city; One species *E. triquetra* was recorded by Ali and Latef, (2017) in Lesser Zab River in Kurdistan north of Iraq; four species *Euchlanis triquetra*, *E. deflexa*, *E. dilatata* and *E. pyriformis* were recorded by Khalid, (2017) in three stations on Tigris River in Baghdad city.

*Description of Philodina sp.*

*Scientific name*

Kingdom: Animalia

Phylum: Rotifera

Class: Bdelliodea

Order: Bdelloida

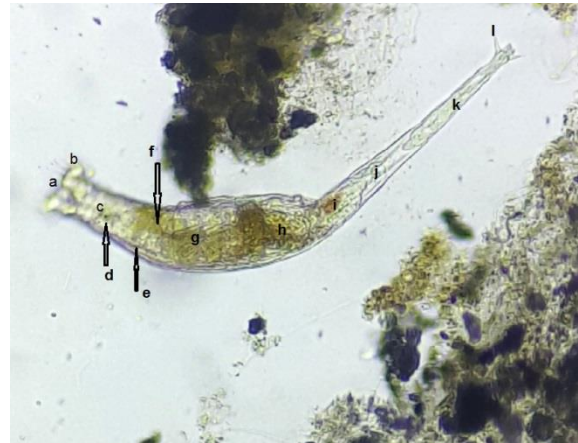
Family: Philodinidae

Genus: *Philodina* (Ehrenberg, 1830)

*Morphology*

This genus has Polymorphism phenomenon that show changes, in one or more characteristics like length of spines, or proportions of the body. It can elongate its body during seeking for the food twice more than normal body (Fig. 3), fixing the toes and rounded in a circle ring then return to normal body (Fig. 4). When it is feeling danger as a high light, it becomes rounded itself as a cyst (Fig. 5 & 6).

The body of *Philodina* can be divided notionally in three parts: corona, cilia, mouth, brain, eye spot, in the anterior part of the body. The flame bulb, salivary gland, stomach, intestine and cloacal bladder in the middle part of the body. In the posterior part there are pedal glands, foot and toe (Fig. 3).



**Fig. 3.** Description of *Philodina* sp. from fresh water: a. Mouth, b. Corona, c. Brain, d. Eyespot, e. Flame bulb, f. Salivary gland, g. Stomach, h. Intestine, i. Cloacal bladder, j. Pedal glands, k. Foot, l. Toe.



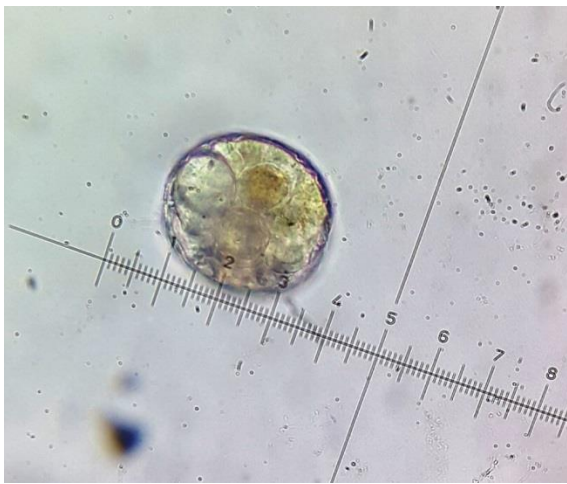
**Fig. 4.** Normal size of *Philodina* sp. from fresh water, 10X.

*Distribution and living aspect*

Genus of *Philodina* are free living; they swim in the pelagial or crawl on substrata (bottom sediments, stems of macrophytes). The vast majority of *Philodina* sp. is solitary but some species form colonies of various sizes (Wallace, 1987).



**Fig. 5.** Contraction of *Philodina* sp. and rounded itself as a cyst.



**Fig. 6.** *Philodina* sp. become as a cyst during threatened.

Almost all free-living *Philodina* are suspension-feeders that utilise microalgae smaller than 12 µm in diameter, bacteria and detritus (Pourriot, 1977); some are obligate or occasional predators.

The current study revealed to distribution of *Philodina* sp. in area 1, area 2 and area 4 from studied areas and others were negative; That similar to Abd Al-Rezzaq *et al.* (2014), Muhanned *et. al.*, (2016), Thijar *et al.* (2016), whom recorded one species *Philodina roseola* in Al Hilla River, AL-Kufa River, Tigris River respectively. While, Hammadi (2016) recorded *Philodina* sp. in six sites in middle of Iraq.

Recently, Ali & Latef, (2017) and Khalid, (2017) recorded two species *Philodina roseola* and *Philodina* sp. in Lesser Zab River in Kurdistan, three stations on Tigris River in Baghdad City respectively.

## References

**Abd Al-Rezzaq Adi J, Salman D Salman, Maysoon M Saleh.** 2014. Rotifera of the Al- Hilla River-Iraq. International Journal of Advanced Biological Research **4(2)**, 158-164.

**Ahmed HK, Mohammed HH.** 2006. The Rotifera community in the South marshes of Iraq. Marsh Bulletin **1(1)**, 54-58.

**Ahmed Huda K, Ghazi Abdulhusein H.** 2014. Rotifers diversity at Shatt Al-Arab River and Shatt albasrah canal, South of Iraq, during the abnormal rising of water salinity. Mesopotamian. Journal of Marine Science **29(2)**, 145-154.

**Ahmed Huda K, Ghazi Abdulhusein H.** 2009. A taxonomical and environmental study of the genus *Brachionus* (Rotifera: Monogononta) (Pallas, 1776) in Al-Hammer marsh, south of Iraq. Iraqi Journal For Aquaculture **6(2)**, 105-112.

**Ali MH, Abdulla DS.** 1999. The biomass of Rotifera in relation to the phytoplankton biomass in Shatt Al-Arab River. Marina Mesopotamica **14(2)**, 279- 289.

**Al-Lami AA, Mangalo HH, Abdul-Kareem TK, Abbas EK.** 1999. Zooplankton occurrence in Euphrates River. Iraq: 1-Rotifera. The Scientific Journal of Iraqi Atomic Energy Commission **1**, 74-82.

**Beers JR, Reid FMH, Stewart GL.** 1980. Microzooplankton population structure in southern California nearshore waters in late spring. Marine Biology **60**, 209-226.

**Edmondson WT.** 1959. Freshwater biology. John Wiley and Sons Inc. New York, 1248pp  
File:///F:/2018%20researches/Rotifera/mebe76\_2009-zooplankton-extended-atlas.pdf

**Ghazi Abdulhusein H, Ahmed Huda K.** 2008. Abundance and Diversity of Rotifera in the Garbat Ali Region Ponds, Basrah-Iraq. Iraqi Journal of Aquacult **5(1)**, 33-40.

- Hammadi, Naeem Shanad.** 2010. An ecological study of Rotifera of the Shatt Al-Arab Region. Phd. Thesis, Basrah University 356 pp.
- Hammadi, Naeem Shanad.** 2016. An ecological survey of littoral Rotifera from some selected areas of Iraq: I. Middle of Iraq. Journal of Basrah Researches (Sciences) **42(2)**, 46-55.
- Ibrahim Sahib Shunon.** 2005. Life Diversity of Invertebrates in the Daghara and Diwaniya Rivers/ Iraq Thesis Ph.D., Faculty of Education, University of Qadisiyah 240pp.
- Khalid A Rasheed, Hussain A Flayyh, Abdulsalam T Dawood.** 2017. The biological indicators studies of zooplankton in the Tigris River at the city of Baghdad. International Journal of Environment, Agriculture and Biotechnology (IJEAB) **2(1)**, 138-148.
- Kostopoulou Venetia, Helen Miliou, George Katis, George Verriopoulos.** 2006. Changes in the population structure of the lineage 'Nevada' belonging to the *Brachionus plicatilis* species complex, batch-cultured under different feeding regimes. Aquaculture International **14**, 451-466.
- Lubzens E.** 1987. Raising rotifers for use in aquaculture. Hydrobiologia **147**, 245-255.
- Mangalo HH, Al-Lami AA, Abbas EK.** 1998. Seasonal variation of zooplankton population in Qadisia Lake, North-West Iraq. I-Rotifera. Al-Mustansiriya Journal of Sciences **9(3)**, 15-20.
- Muhammed R Nashaat, Khalid A Rasheed, Hussein A Hassan.** 2016. Global Journal of Science Frontier Research: H Environment & Earth Science **16(5)**, 48-58.
- Nogrady T, Wallace RL, Snell TW.** 1993. Rotifera, Vol.1. Biology, Ecology and Systematics, Guides to the Identification of the Microinvertebrates of the Continental Waters of the World, Vol. **4**. SPB Academic Publishing, The Hague. 241 pp.
- Pennak RW.** 1989. Freshwater invertebrates of the United States, 3rd ed., John Wiley & Sons., New York.
- Póltorak T, Bartel R, Szczerbowski JA.** 2001. Horizontal distribution of zooplankton in Lakes Tharthar, Habbaniya and Razzazah. Archives of Polish Fisheries **9(1)**, 111 - 126.
- Pourriot R.** 1977. Food and feeding habits of Rotifera. Arch. Hydrobiol. Beih. Ergebn. Limnol **8**, 243-260.
- Rabee Adel Mashaan.** 2007. Biodiversity of the two groups of dolphins and branching of the whispers at the upper part of the Euphrates River - Iraq. Umm Salamah Journal of Science **4(2)**, 221-232.
- Rabee Adel Mashaan.** 2010. The effect of Al-Tharthar-Euphrates canal on the quantitative and qualitative composition of zooplankton in Euphrates River. Journal of alnahrain University **13(3)**, 120-128.
- Sabri AW, Maulood BK.** 1989. Rotifera in river Tigris: I. Faunal Composition. Journal of Biological Sciences Research **20(2)**, 285-298.
- Sabri AW.** 1988. Ecological studies on Rotifera (Aschelminthes) in the Tigris River, Iraq. Acta Hydrobiologica **30**, 367-379.
- Segers H.** 2002. The nomenclature of the Rotifera: annotated checklist of valid family – and genus – group names. Journal of Natural History **36**, 631-640.
- Segers H.** 2004. Rotifera: Monogonota. In Freshwater Invertebrates of the Malaysian Region. (Yule, CM and Yong HS, Eds.). Academy of sciencesmalaysia and Monash University, Malaysia, Kuala Lumpur. 112-126.
- Shiel RJ, Merrick CJ, Ganf GG.** 1987. The Rotifera of impoundments in southeastern Australia. Hydrobiologia **147**, 23-29.
- Telesh Irena, Lutz Postel, Reinhard Heerkloss, Ekaterina Mironova, Sergey Skarlato.** 2009. Zooplankton of the Open Baltic Sea: Extended Atlas. Meereswissenschaftliche Marine Science Berichte Reports **76**, 301 pp.

**Telesh IV, Heerkloss R.** 2002. Atlas of Estuarine Zooplankton of the Southern and Eastern Baltic Sea. Part I: Rotifera. Verlag Dr. Kovač, Hamburg 89 pp.

**Thijar LA, Sajida FH, Teser KhA, Shatha ASH.** 2016. Biodiversity of Rotifera in Tigris River at Baghdad City. International Journal of Innovation and Applied Studies **16(2)**, 331-341.

**Wallace RL.** 1987. Coloniality in the phylum Rotifera. Hydrobiologia **147**, 141-155.

**Wallace RL, Terry WS, Ricci C, Nogrady T.** 2006. Rotifera: Vol.1: Biology, Ecology and Systematics (2th edition). Kenobi Productions, Backhuys Publishers. 299pp.