

# New record species of the Genus *Microcyclops* Claus, 1893 (Crustacea: Copepoda: Cyclopoida) in the Holy Karbala Province / Iraq

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## ARTICLE INFO

Submission date: 7 / 5 / 2019

Acceptance date: 26 / 6 / 2019

Publication date: 1 / 11 / 2019

## Abstract

The present study introduces new record species *Microcyclops varicans*, (Sars, 1863). The samples of the study were collected from Al-hindiyah region in Holy Karbala governorate at 12.8.2015. The external morphological characters were used to recognize and describe the species under study and compare them with the related species of the genus *Microcyclops*, such characters are: body is small, thin, milky white, Anal segment with spinules along the dorsal and ventral sides of its posterior surface; Antenna supplied by two rows of curved spinules near its middle external surface, both exopod and endopod are 2-segment; intercoxa of the fourth pedigerous (P4) is slightly smaller than those of the first and third pedigerous; base of the fifth pedigerous (P5) is connected with the fifth somite and with one short spine and one seta.

**Key words:** Copepoda, Cyclopoida, "*Microcyclops varicans* (Sars, 1863)" Taxonomy, Iraq

## Introduction

Cyclopoida represents an important group of fresh-water zooplankton. They usually occupy lakes, swamps, aquatic reservoirs, rivers, and temporary swamps [1]. It is one of the most important groups that form the whole mass of plankton in the ecosystem [2]. The zooplankton such as: Copepoda: Cyclopoida are representing as nutrient mediator between producers and consumers, and it is also regarded as the main source of food to fishes, large Crustacean and Molluscs, and also they play a role in controlling the relation between materials and energy in the aquatic ecosystems [3], [4], [5], [6], [7].

Members of cyclopoida are important in environmental , economical and medical aspects , in addition to the roles of some species of the genera *Thermocyclops*, *Mesocyclops* and *Metacyclops* as intermediate hosts for the worm *Dracunculus medinensis* in west Africa and south Asia[8],[9].

Species of the genus *Microcyclops* are characterized by the followings: body small 500-700un; generally the lengths of the Furcal rami are 3-4 times as their widths ; antennule (A1) is 11-12 segment ; length of the antennule not more than the length of the Cephalothorax region ; each of the two branches of the exopod and endopod of the first - fourth pedigerous are consisting of two segments; fifth pedigerous is cylindrical , and with one lateral seta ; seminal receptacle posteriorly enlarged ; endopod of the fourth pedigerous with well developed apical spine ; number of species are nearly 65 species [10],[11].

## The aim of study

Due to the lack of Iraqi fauna to detailed Taxonomic Morphological Study on Species of Order : Cyclopoida and Reality taxonomic evaluation through external morphological study of species and diagnosis , description and Supported with illustrations

## Methods and materials

Samples under study were collected from Al-Hindiyah District of Holy Karbala governorate at 12.8.2015 in 9.00 am. The collected samples were included 3 females, preserved in suitable vials containing 80 % Ethanol and 20% glycerol. Specimens were fixed by using lactic acid. In the process of dissection and separation of body parts; suitable dissecting pins and needles were used with the aid of dissecting microscope. The following body parts were isolated :, Antennule, Antenna , mouth parts , P1, P2,P3,P4, P5 was used for All the characters of study were identifying and illustrated by using microscope with a camera lucida. In the taxonomic procedure , the following keys were used [10], [11],[12],[13],[14],[15]

## Results and Discussion

### *Microcyclops varicans* (Sars, 1863).

This species is regarded as new record to the Iraqi fauna of cyclopoida.

### Systematic

Phylum: Arthropoda Latreille, 1829

Class: Crustacea Brunnich, 1772

Subclass: Copepoda H.Milne- Edwards, 1840

Order:Cyclopoidae Burmeister,1934

Family:Cyclopidae G.O.Sars, 1913

Subfamily: Cyclopinae G.O.Sars, 1913

Genus: *Microcyclops* Claus, 1893

Species : *Microcyclops varicans* (Sars, 1863)

**Body (Fig 1 A)** Relatively small; thin , milky white , overall length from the anterior end of the cephalothorax to the Furcal rami except the Furcal seta is 0.9 mm.

**Prosoma (Pr):** Enlarged ; oval , length 0.4 mm and width 0.3mm; include cephalothorax region limited by the first pedigerous (P1) followed by three segments of free pedigerous; each of the second , third; fourth somite are with lateral curvature end of the antennule extends near the middle of the cephalothorax.

**Urosoma (Ur)** Long and thin; consist of five segments differ in shape and size, fifth somite is narrow and smallest one with smooth triangular surface; paired genital –double somite short and wide, anterior part slightly swollen laterally and narrowed toward the end ; third abdominal somite quadrate and slightly bigger than fourth one; last anal segment is connected with the pairs of the Furcal rami , and in this point of junction there is a row of short spinules along the dorsal and ventral sides of its posterior surface.

**Furcal Rami(FuR)(Fig :1 B)** Short, wide and equal in length , internal surface with hairs, each Furcal rami has six feathery setae differ in sizes and lengths , one of those setae is short lateral situated of the end of last third of ramous , other seta is longer than the lateral seta and situated on the dorsal surface near the terminal end of the Furcal rami, other four setae are hold on the terminal end of the rami , these four setae are arrangement as: one external short, other internal long, and tow middle setae one of them is short and the other long.

**Antennule : (A1)( Fig 2)** 12- Segmentes, differ in shape and length, the first is large and elongate on its dorsal surface near the base, bear a raw of spines. fourth and seventh segment are large and both of them smaller than the first, eight and ninth segments are elongated cylindrical, last three segment are identical in shape and size. Setae(s), aesthetas( ae) are arranged as follows:

1(10s), 2(2s), 3(2s), 4(3s), 5(2s), 6(2s), 7(1s), 8(2s), 9(2s+1ae), 10(2s), 11(2s), 12(7s).

**Antenna A2:(Fig 3)** 4- segments; Basal segment long and rectangular on its internal anterior surface there is two setae moderate in length ; Frontal surface with two rows of spines obliquely arranged; branches of the exopod and endopod are connect to the base ; exopod is reduced to relatively long seta reach to the base of the last segment and this seta is situated on the far external angle of the basal segment ; endopod consist of three segments , first segment with moderate seta situated on the middle of the internal surface. Second segment narrow at its base but enlarged toward the apex and bear six setae graduate in length and situated along internal surface. Third segment and the last segment are both thin and short and the external surface of each bear five hairs, the apical end supplied by moderate four setae.

**Mandible(Mn) : (Fig 4)** 1- segment , Base wide and narrowing toward the apex to from the Coxalgnathobase which supplied by six teeth differ in size and length ended by two acute setae ; mandipular palp reduces and bear three long thin smooth setae.

**Maxillula(Mxl) : (fig 5)** 1- segment ; precoxa enlarged structure narrowing toward the apex and ends by three claws; the internal surface supplied by four spine – like seta; and two smooth setae , one of them has group of spines on its apical end, while the other is smooth ; maxillary palp consist of two segments, first is long and its apex bear three seta ,one short and thick while the other two are smooth and thin , second segment is laterally situated ,small in size and bear three long ,thin ,smooth setae.

**Maxilla(Mx) :(Fig 6)** 4- segments, precoxa irregular with small process on its external surface, while the internal surface bear curved process resemble a lobe and bear two long setae one of them bear spinules along one side and the other smooth , second segment which is the coxa is large and long internal surface bear moderate spinules seta, e far of the end of coxa is connected by distal endite supplied by thick spine; endopod consist of two segment , first one bear thick spine its base broad while its internal surface bear a row of spinules and a thin seta supplied by three spinules on one sides, the second segment small and bear three smooth setae.

**Maxilliped (Mxp);(Fig7)** 4- segments, syncoxa large ,elongated and irregular in shape , internal surface bear two setae supplied by spinules on its both sides,one of these spinules short and the other long; there are three oblique spinules near the external surface, the basal segment is elongated, internal surface bear one seta supplied by spinules along its sides its surface covered by group of comb- like spinules arranged transversally; endopod consist of two segments, the first bear thick seta supplied by group of spinules on its both sides , second segment is smaller than the first but bear three setae one of them long and bear group of spinules on its both sides while the other two are smooth.

**1<sup>st</sup> pedigerous p1 : (Fig 8)** Intercoxa sclerites irregular , with a pair of smooth circular chitinous processes, anterior surface pointed ; coxa rectangular , external surface with a row of short hairs its dorsal with a row of comb –like spines near its external surface , intercoxal angle with coxal setae, internal , thick ,ciliated seta . two branched of the endopod and exopod are both connected to the basal segment **Exopod** Consist of two segment , first segment with a short, lateral , toothed spine on external surface, internal surface with a row of hairs one short, ciliated seta; second segment bigger, circular and with three lateral toothed spines on external surface with five ciliated setae .**Endopod** Consist of two segment ; external surface of the first segment with hairs while the internal surface of the first segment with hairs while the internal surface supplied by one ciliated seta; second segment is larger than the first and supplied by one ciliated seta and a row of hairs on its external surface its internal surface bear three setae, apical end bear one seta and one large toothed spine and one lateral spinule.

**2<sup>nd</sup> pedigerous P2 : (Fig 8)** Intercoxa quadrate posterior surface with a pair of smooth circular chitinous processes anterior surface concave coxa rectangular , intercoxal angle with a coxal ,internal ,thick ,ciliated seta situated, segment of the basipodite is irregular in shape, external surface supplied by non- ciliated seta of the basipodite , internal surface circular and bears a group of hairs, middle surface with a pointed process , two branches of the endopod and exopod are both connected to the basal segment .; **Exopod** Consist of two segment , first segment with a short, lateral , toothed spine on external surface, internal surface with, one ciliated seta, in the point of junction between both segments there is arrow of spinules , second segment is larger and longer from the first one and is supplied by three lateral toothed spines on its external surface

, its internal surface with four ciliated setae, the apical end has one ciliated seta and one big long toothed lateral spine. **Endopod** Consist of two segment; external surface of the first segment with hairs while the internal surface has one ciliated seta, at the point of junction between the first and second segments there is a row of spinules, second segment bigger and longer than the first and bears a row of hairs and ciliated seta on external surface while its internal surface bear three setae, apical end has one ciliated seta and two toothed spines one is long and the other short.

**3<sup>rd</sup> pedigerous P3(fig: 10)** Intercoxa quadrate, posterior surface with pair of circular smooth, chitinous processes, anterior surface truncate, coxa rectangular and bear a row of hairs on external surface, at the point of junction between the coxa and the endopod segment there is a row of spinules, a coxal, internal, thick, ciliated seta at the intercoxal angle, segment of the basipodite irregular in shape, external surface supplied by the non-ciliated seta of the basipodite, internal surface circular with group of hairs, the middle surface is zigzag, two branched of the endopod and exopod are both connected to the basal segment. **Exopod** Two segments, the first one with one short, lateral toothed spine on external surface, internal surface with one ciliated seta, second segment larger and longer than the first and is supplied by three lateral toothed spines on external surface, internal surface bears four, long, ciliated setae, the apical end supplied by one ciliated seta and one toothed long spine. **Endopod** Two segments, external surface of the first segment with hairs while internal surface with one ciliated seta, second segment larger and longer than the first and its external surface bear a row of hairs and on ciliated seta, internal surface bear four setae, apical end bear two, longer, toothed spines equal in length.

**4<sup>th</sup> pedigerous P4: (Fig:11)** Intercoxa quadrate, posterior surface with a pair of circular, smooth, chitinous processes, anterior surface concave, coxa is rectangular, dorsal surface with a row of spinules transversely arranged near its external surface. at the point of junction between the coxa and basipodite segment, there is a row of spines, coxal, internal thick ciliated seta at the intercoxal angle, segment of the basipodite is irregular in shape, internal surface circular with a group of spines, middle surface of the segment with pointed process, two branches of the endopod and exopod are both connected to the basal segment. **Exopod** Two segments, the first one with a short lateral toothed spine on external surface, internal surface smoothed, second segment larger and longer than the first and with two toothed lateral spines on its external margin, internal margin with four ciliated long setae, apical end supplied by one ciliated seta and one toothed spine. **Endopod** Two segment, external surface of the first segment with hairs, internal surface with one ciliated seta, at the junction between first and second segment with a row of spinules, second segment bigger and longer than the first, external surface bear a row of hairs and one ciliated seta, internal surface bear two toothed spines, one is long and the other short with two lateral spines

**5<sup>th</sup> pedigerous P5(fig 12)** Two segment, basal segment is broad and united with the fifth somite, bears one lateral ciliated seta, exopod is cylindrical, long thin with one terminal seta.

**Examined samples:** 3 females, Collected from Al-Hindiyah District Holy Karbala Governorate 12.8.2015, 9.00am.

**T:48** °C

**PH:8**

## Conclusion

1. This species is regarded as new record to the Iraqi fauna of cyclopoida
2. Body is small , thin , milky white , the paired genital segment is elongated with anteriolateral swallowed processes ; anal segment with spinules along the dorsal and ventral sides of its posterior surface ; Furcal rami are smooth , equally in length .
3. Antenna supplied by two rows of curved spinules near its middle external surface.
4. The basal segment of the maxilliped with a row of spinules.
5. Both exopod and endopod are 2-segment .
6. Intercoxa of the fourth pedigerous (P4) is slightly smaller than those of the first and third pedigerous(P3) .
7. Second segment of the third pedigerous with two identical spinules .

## Acknowledgement

I would like to thank Dr. Maria Holynsk. MUSEUM AND INSTITUTE OF ZOOLOGY. - POLISH ACADEMY OF SCIENCE - POLAND.

Dr. Maria Bruno- HYDROBIOLOGY RESEARCH UNIT –ITALY.

Dr. Cheon Young Chang C. From Korea for their Kindly help in identification of Specimens.

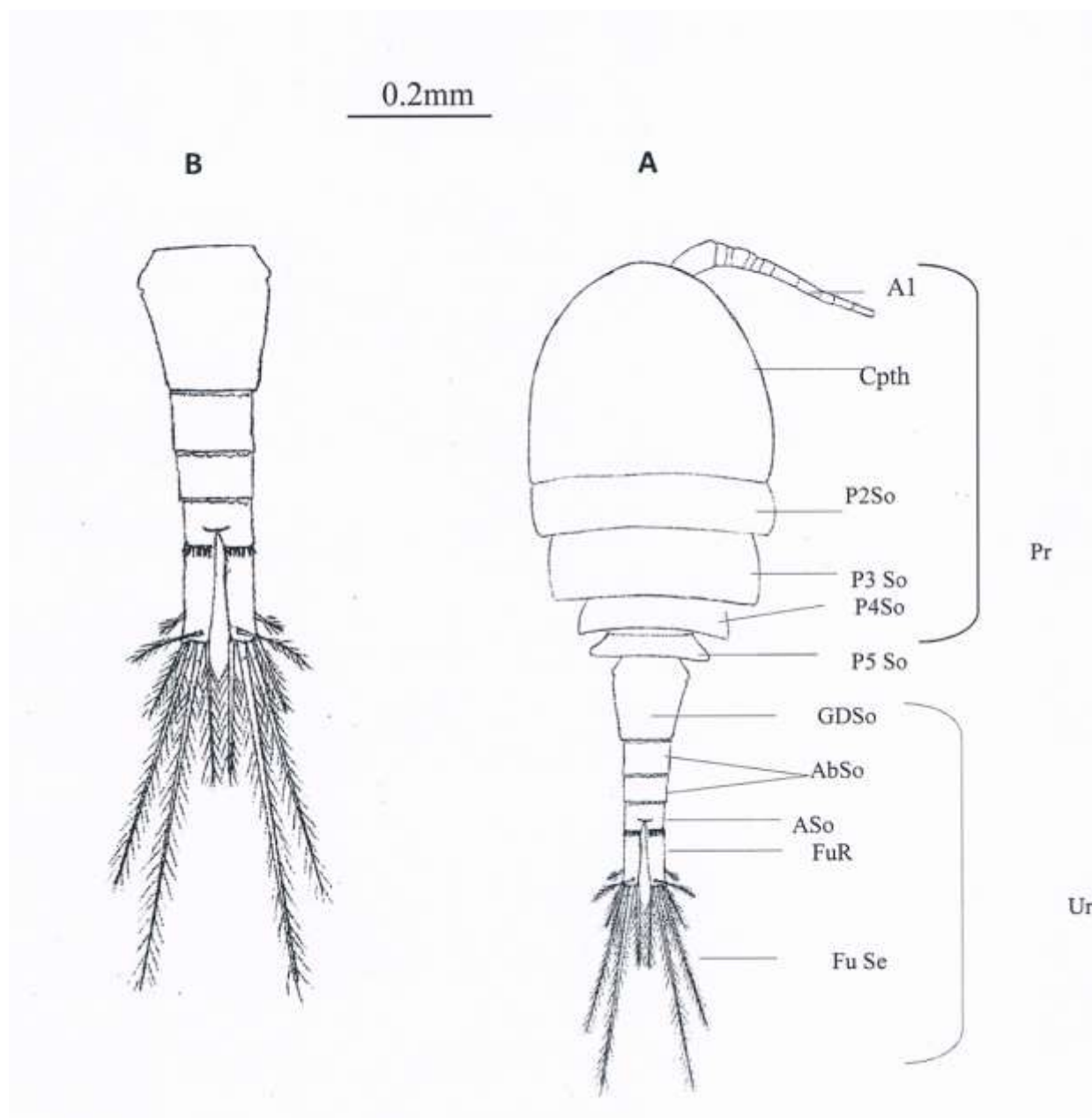
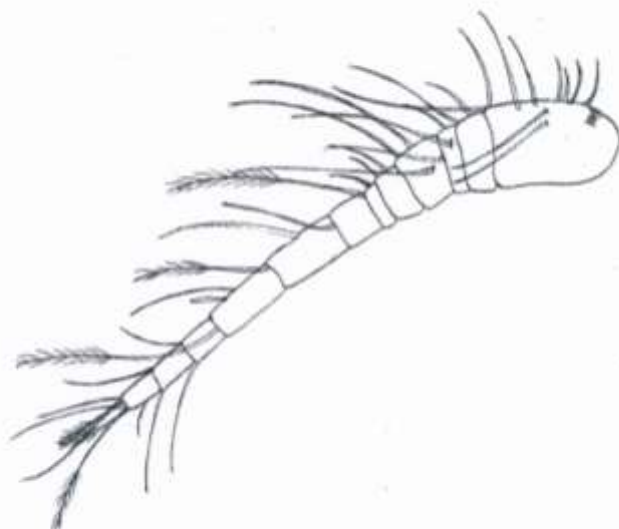


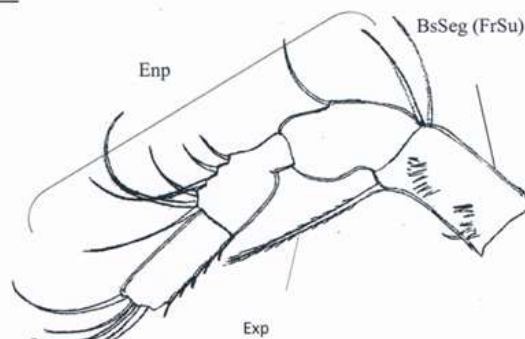
Figure 1: *Microcyclops varicans* (Sars 1863) Adult female A-dorsal B-Urosoma

0.2mm



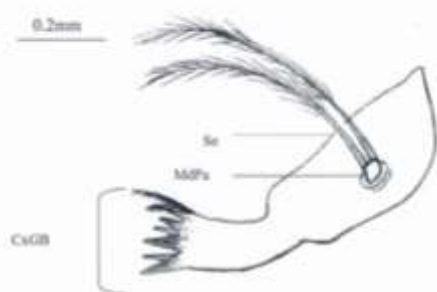
Figure(2) Antennula  
*Microcyclops varicans* (Sars 1863)

0.2 mm



Figure(3) Antenna  
*Microcyclops varicans* (Sars 1863)

0.2mm



Figure(4) Mandible  
*Microcyclops varicans* (Sars 1863)

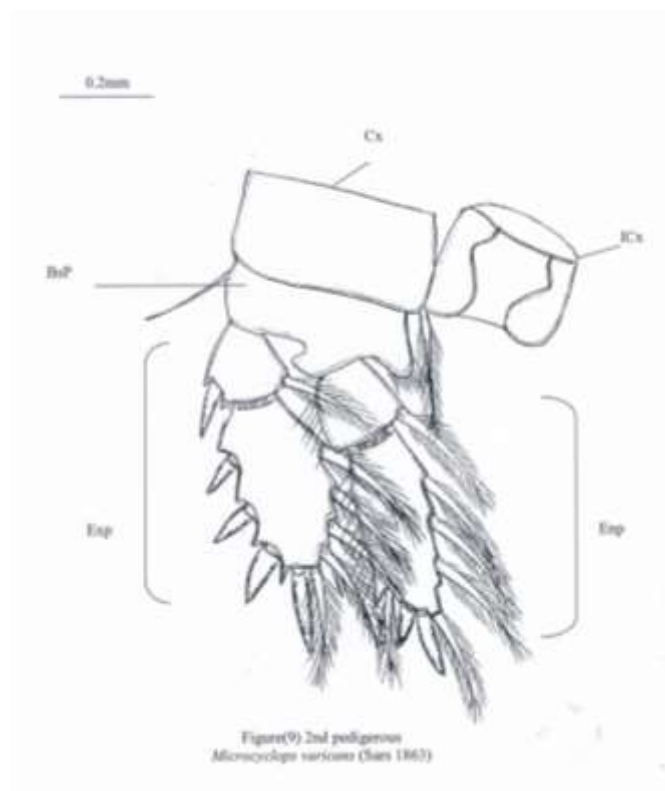
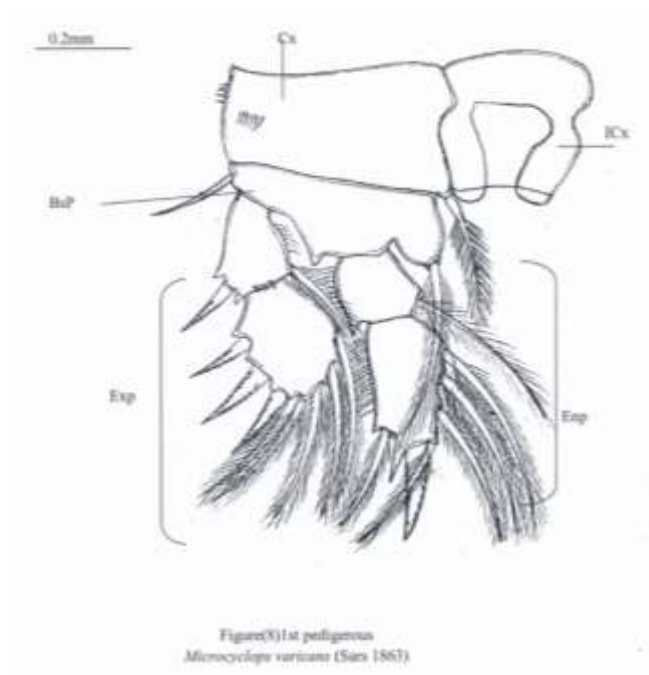
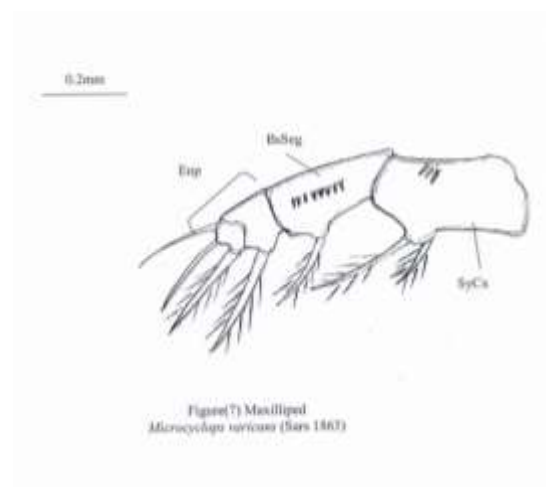
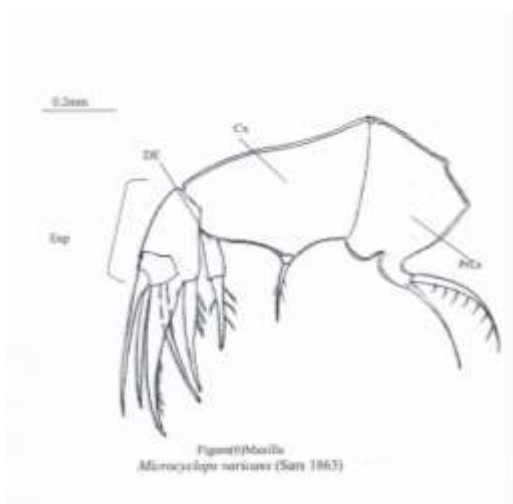
0.2mm



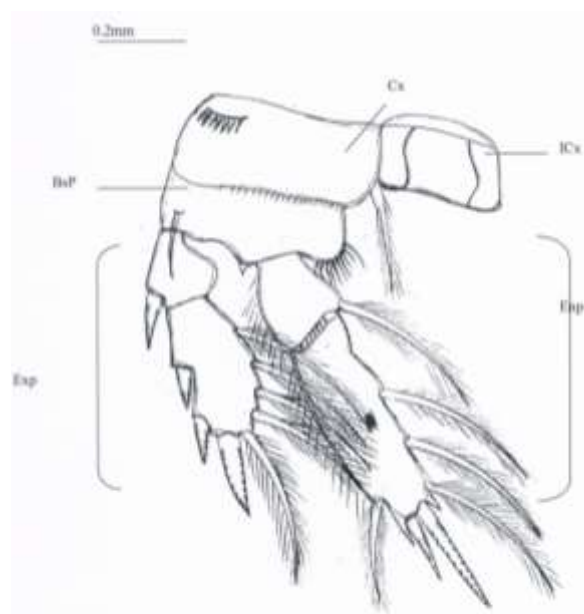
Figure(5) Maxillula  
*Microcyclops varicans* (Sars 1863)

**Figure 1: *Microcyclops varicans* (Sars 1863) Adult female A:Antennula B:Antenna C:Mandible D:Maxillula**

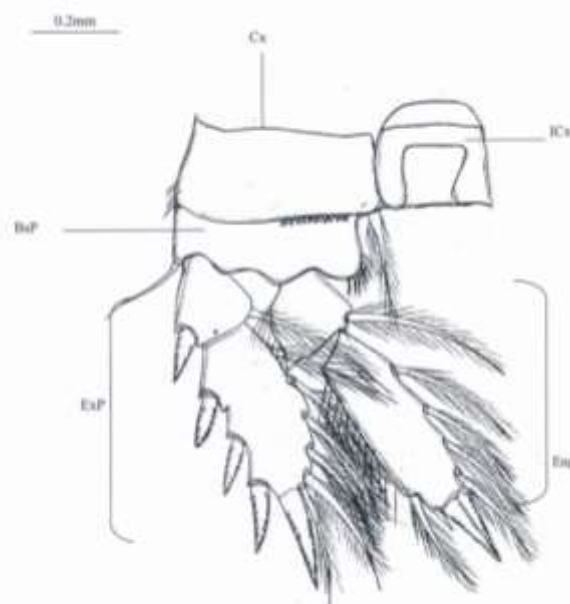




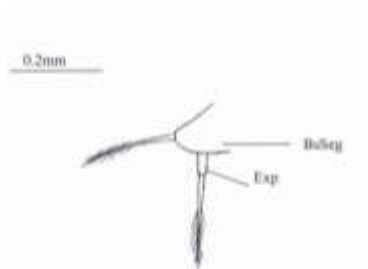
**Figure 1: *Microcyclops varicans* (Sars 1863) Adult female A: Maxilla B: Maxilliped  
C:1st Pedigerous D:2 nd Pedigerous**



Figure(11) 4th pedigerous  
*Microcyclops varicans* (Sars 1863)



Figure(10) 3rd pedigerous  
*Microcyclops varicans* (Sars 1863)



Figure(12) 5th pedigerous  
*Microcyclops varicans* (Sars 1863)

**Figure 4: *Microcyclops varicans* (Sars 1863) A: 3rd Pedigerous B: 4 th Pedigerous  
C: 5 th Pedigerous**

Brief	Term
A1	Antennule
A2	Antenna
AnSo	Anal Somite
Ab So	Abdominal Somite
Ae	Aesthetase
Bs	Base
BsSeg	Basal Segment
Bsp	Basipodite
Cpth	Cephalothorax
Cx	Coxa
CxGb	Coxal Gnathobase
C l	Claw
CaSu	Caudal Surface
DE	Distal Endite
Enp	Endopod
Exp	Exopod
FuR	Furcal rami
FuSe	Furcal seta
FrSu	Frontal Surface
GDSO	Genital- Double Somite
ICx	Intercoxa
La	Labrum
Md	Mandible
Mxp	Maxilliped
MdPa	Mandibular Palp
Mxl	Maxillule
Mx	Maxilla
MxlPa	Maxillary Palp
Pr	Prosoma
P1	1 <sup>st</sup> Pedigerous
P2	2 <sup>nd</sup> Pedigerous
P3	3 <sup>rd</sup> Pedigerous
P4	4 <sup>th</sup> Pedigerous
P5	5 <sup>th</sup> Pedigerous
PrCx	PrCoxa
SyCx	SyCoxa
Se	Seta
Sp	Spine
So	Somite
Seg	Segment
SR	Seminal Receptical
Te	Teeth
Ur	Urosoma

### Conflict of Interests.

There are non-conflicts of interest .

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## الخلاصة

تناول البحث تسجيل نوع جديد *Microcyclops varicans* (Sars 1863) يعود للجنس *Microcyclops* Claus، 1893 ، جمعت النماذج من محافظة كربلاء/قضاء الهندية بتاريخ 12-8-2015. يعد هذا النوع تسجلاً جديداً للمجموعة العراقية لرتبة Cyclopoida . شخص النوع ووصف بالاستناد الى صفات المظهر الخارجي للجسم واللواحق والتي تميزه عن باقي الانواع العائدة للجنس *Microcyclops* . الجسم صغير ورفيع ذو لون ابيض حليبي القطعة المزدوجة التناسلية متطاولة مع بروزات جانبية منتقخة من الامام، القطعة المخرجية مزودة بشويكات على طول الحافة الخلفية ظهرياً وبطنياً. الافرع الذنبية ملساء متساوية بالطول . اللوئيمس قصير 12 قطعة. السطح الخلفي للامس مزود بصفيين من الاشواك المنحنية بالقرب من منتصف الحافة الخارجية . القطعة القاعدية للقدم الفكي Maxilliped مزودة بصنف من الشويكات . القدم الداخلي والخارجي للواحق القدمية P1-P4 ذو قطعتين. القطعة ما بين الحرقفتين Intercoxa لل P4 اصغر بقليل من باقي اللواحق P1-P3. القطعة الثانية للقدم الداخلي End2 لل P3 مزودة بشوكتان متساويتان بالطول قاعدة اللاحقة القدمية الخامسة متصلة بالقطعة الجسمية الخامسة مزودة بشوكة قصيرة وهلب .

الكلمات الدالة: العراق " تصنيف, *Microcyclops varicans* (Sars, 1863) "سايكلو بويدا, , مجذافيه الاقدام