



ISSN 2305-1088

<https://jsasj.journals.ekb.eg>

JSAS 2023; 8(2): 57-63

Received: 02-08-2023

Accepted: 30-08-2023

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## **Survey and Identification of Copepods occurred at different aquatic habitats in Minia Governorate**

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### **Abstract**

Copepods are a group of small crustaceans found in nearly every freshwater and saltwater habitat. Samples of Copepods were collected from different ponds, canals and drains along Minia Governorate districts. Adult copepods are extracted and used as a startup culture. These stages are fed on Paramecium and wheat grain for the preparation of pure culture. Air pumps were used to provide the necessary oxygen. Other adult stages were preserved in 70% ethanol in order to identify the occurred copepods species. Identification of copepods was made on the basis of morphological characters following the keys of copepods. According to the different keys for the classification of copepods, it was noticeable that the morphological traits of the surveyed copepods matched with five species belonging to the Cyclopidae distributed in Minia Governorate. These species were *Afrocylops gibsoni*, *Ectocylops phaleratus*, *Eucyclops serrulatus*, *Mesocyclops ogunnus*, *Macrocylops albidus*. It was obvious that the surveyed species from Cyclopoids differed in their occurrence from locality to other all over Minia Governorate. The most occurred species in three locations were *Mesocyclops ogunnus* and *Macrocylops albidus* in Dafash, Shalaby and Om Sant village canals

**Keywords:** Copepods, *Afrocylops gibsoni*, *Eucyclops serrulatus*, *Mesocyclops ogunnus*, *Macrocylops albidus*.

## INTRODUCTION

Cyclopoids were found in freshwater ponds as well as in slow moving bodies of water. They often were found in the same locations where Daphnia are found. (Kocher et al., 2018; Dvoretzky and Dvoretzky, 2023) found that *Cyclops* congregate most heavily in the still areas of water that have algae growth. External morphology of Cyclops overall the world was described by (Hanan Zwair, 2016; Mahoon and Zia, 1985; Marten, 1989; Hussein, 1991; Reid, 1992; Kawabata, 1994; Mirabdullayev, 1996; Ishida, 1998; Hussein et al., 1999; Guo, 2000; Matsumura-Tundisi and Silva, 2002; Hołyńska et al., 2003; Alekseev et al., 2006; Díaz et al., 2006; Kocher et al., 2018)

## MATERIALS AND METHODS

### 2.1- Collection and Breeding of cyclopoid copepods:

zooplankton net mesh size 60 mm (Kawabata, 1994; Ishida, 1998) was used according to (Kocher et al., 2018; Dvoretzky and Dvoretzky, 2023; Peters et al., 2023) for collecting sample copepods from lake, ponds and other standing water sources in Minia Governorate. Samples were transferred in plastic jars to the laboratory. The adult of copepods extracted and used as a startup culture. These stages fed on *Paramecium* and wheat grain at pure stage. Air pumps used to provide the necessary oxygen. Other adult stages preserved in 70% ethanol to identify them.

### 2.2- Identification of cyclopoid copepods

Samples of copepods were killed and fixed in appropriate fixing solution then transferred to a clean slide with a drop of Hoyer's media and covered with glass according to (Ishida, 1998; Ashlock et al., 2021; Beroujon et al., 2022). Identification of copepods on basis of morphological characters followed the keys of copepods (Ishida, 1998; Tavares-Dias and Oliveira, 2023)

### 2.3- Occurrence and distribution in Minia Governorate

Based on the definition of the species, the extent of distribution and spread of cyclopoids from different places in Minia Governorate were determined.

## RESULTS AND DISCUSSION

### 3.1- Identification of all collected samples:

During 2022- and 2023-year different samples of copepods were collected from ponds and channels located in different districts of Minia Governorate and transferred to the laboratory for identification.

All copepods found in our survey were to be belonging order cyclopoida, whereas the body could be divided into four major regions; namely cephalothorax (head + 1<sup>st</sup> thoracic segment), thorax, abdomen and furca. The cephalothorax bears antennule, antenna, maxillule, maxilla, maxilliped and 1<sup>st</sup> leg. The thorax includes five free segments bearing 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> leg. The abdomen includes five segments. In adult female, the first two segments fused into one large genital segment. So the abdomen consists of four segments. In the male, there is no fusion of segments in the abdomen. The furca consists of two symmetrical caudal rami armed with six setae.

Result in figure (1) shows the description of some specimens of copepods that collected from Minia Governorate. These specimens revealed the following description whereas the caudal rami of our specimens were ornamented with three proximal rows of long spines and two distal rows of short spines and nearly all females had antennae with 11 segments (one with 10/11 combination). These characters are agree with the general description of *Mesocyclops ogunurus* illustrated by (Reid, 1992; Marchese et al., 2022)

The other collected samples from Minia Governorate described in figure (2) showed that the body of female is large with total length range between 1500-1800  $\mu\text{m}$ . While length with the male was 1110-1410  $\mu\text{m}$ . The caudal rami of these specimens were ornamented with three proximal rows of long spines and two distal rows of short spines and nearly all females had antennae with 17

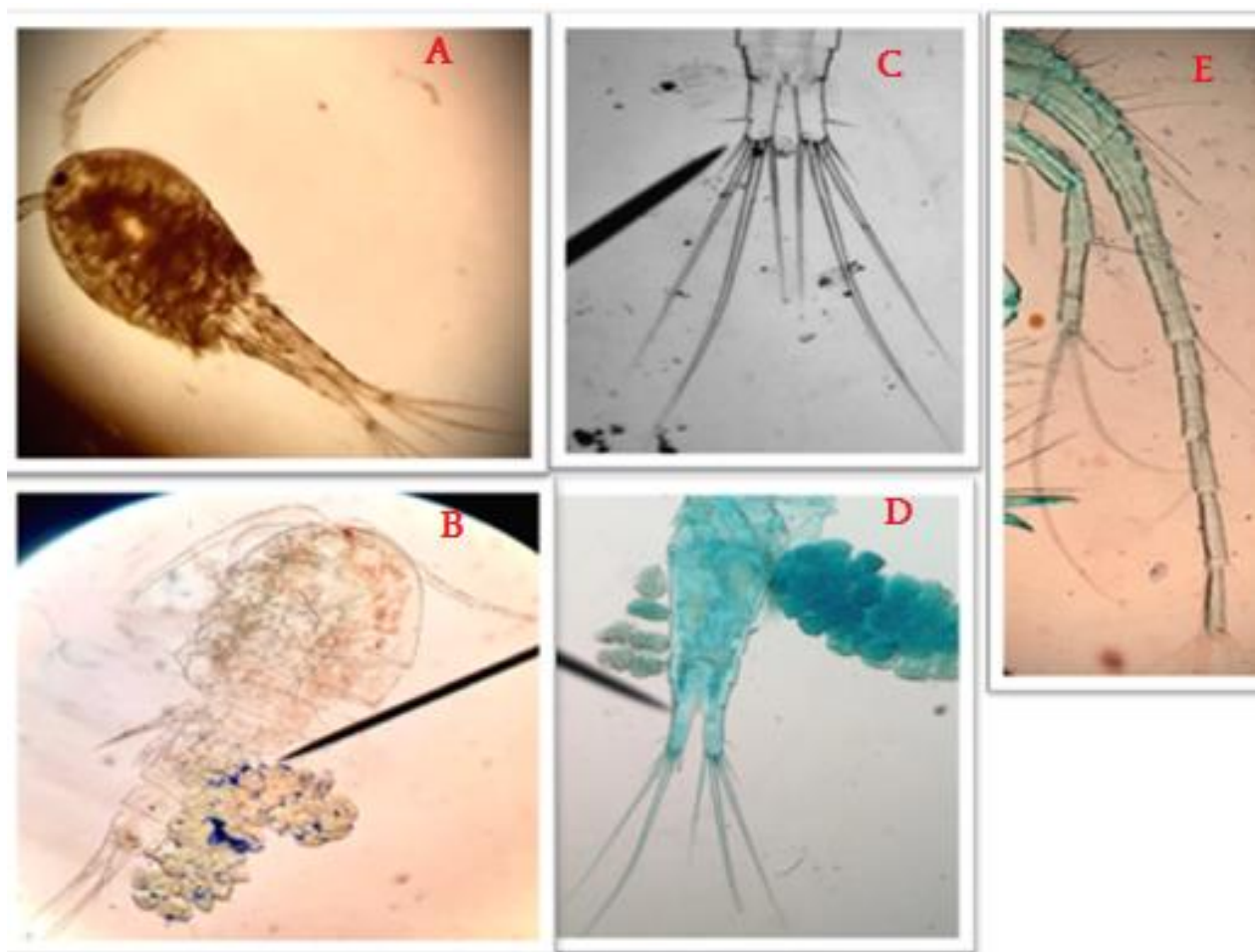
segments. These characters all agree with the general description of *Macrocylops albidus* (Ishida, 1998; Matsumura-Tundisi and Silva, 2002; Dvoretzky and Dvoretzky, 2023). Result in figure (3) showed that length of caudal rami in relative to width was in average of 6.0. Antennae of female, slender with 12 segments with hyaline membrane or spinules with segment 12. These details identically in similar with *Eucyclops serrulatus* that described by (Ishida, 1998).

From the most occurred copepod species the following specimen described in figure (4) whereas the caudal rami length over width was 7 times. Female antennae were consisting of 12 segments but in male it composed of 15 segments. These features superpose morphological characters of *Afrocylops gibsoni* (Ishida, 1998; Tavares-Dias and Oliveira, 2023)

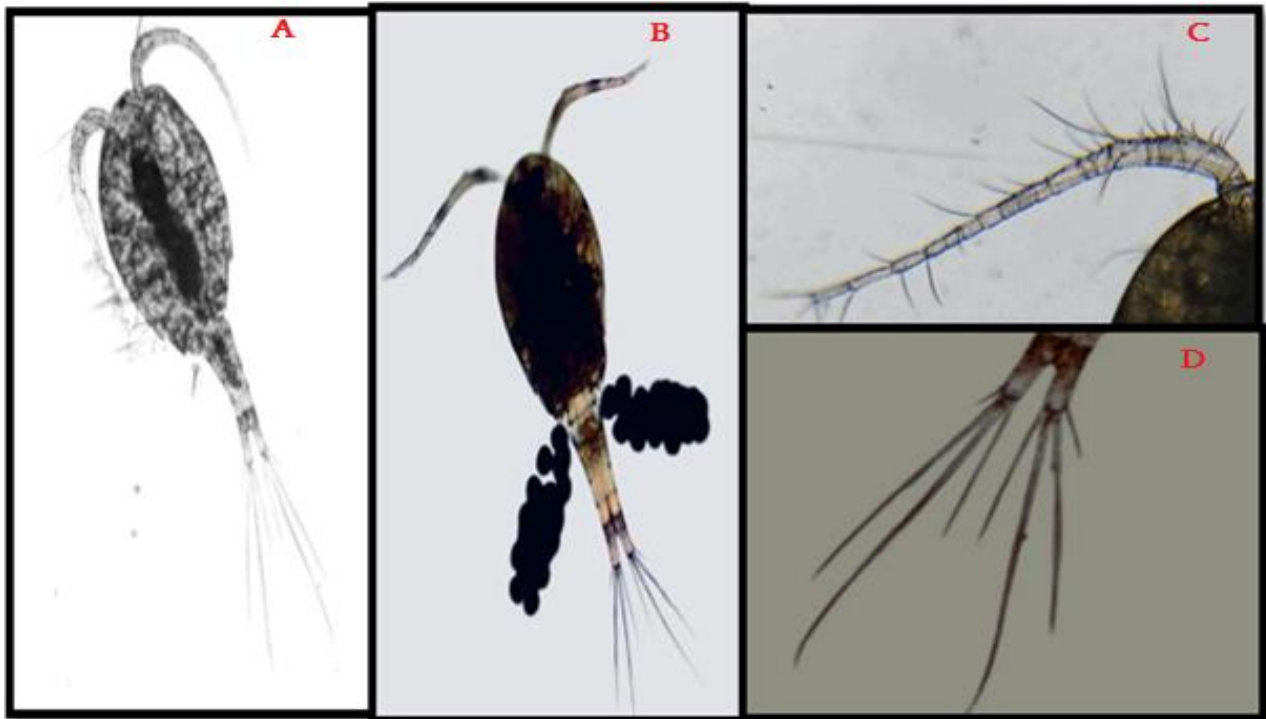
The 5<sup>th</sup> specimen as illustrated in figure (5) shows a species of copepod featured by the presence of 4-6 transverse rows of spines in dorsal view of the caudal rami in both male and female. Antennae of male composed of 17 segments.

### 3.2- Distribution of cyclopoid species in Minia Governorate

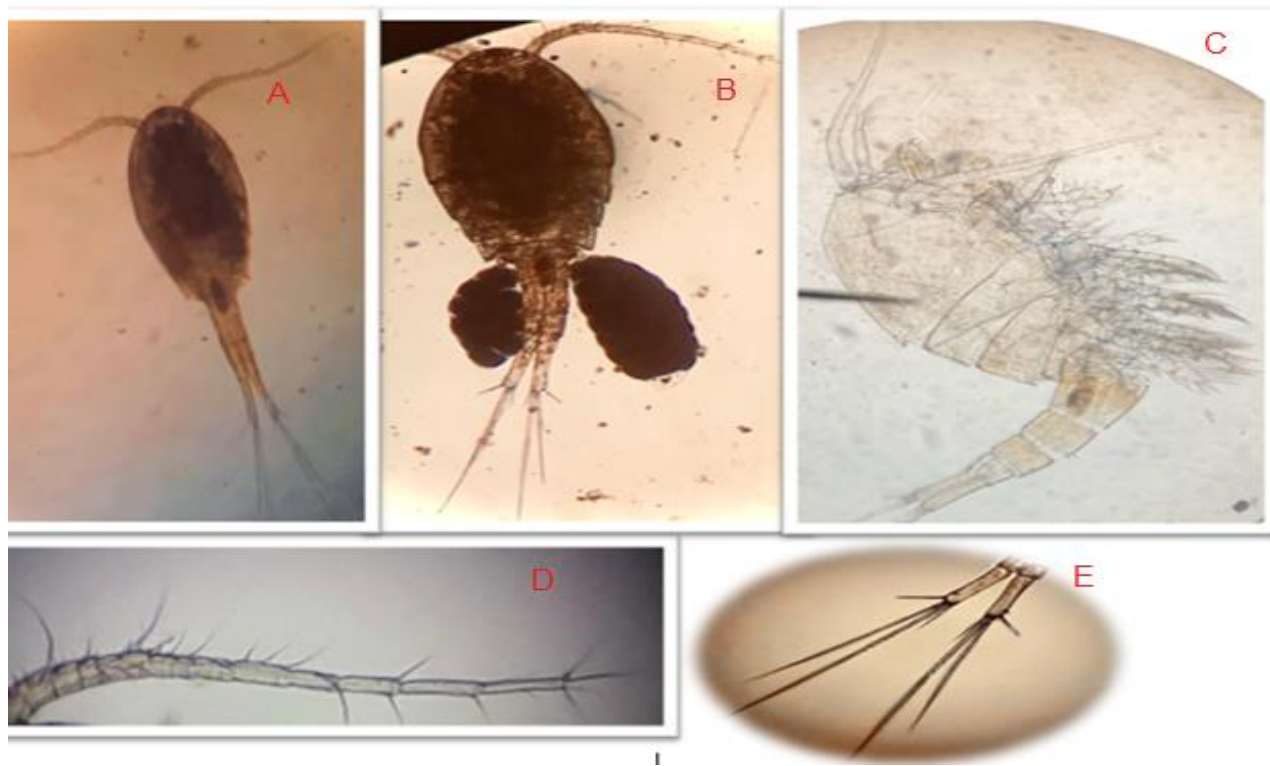
It was obvious that the surveyed cyclopoid species differed in their population from locality to other all over Minia Governorate. The most occurred species in three locations were *Mesocyclops ogunnus* and *Macrocylops albidus* in Dafash, Shalaby and Om Sant village canals (Table 1). *Afrocylops*, *Ectocyclops* and *Eucyclops* were found in the ponds containing standing water next to the agricultural fields but *Mesocyclops* and *Macrocylops* were collected from drains that stored out sewage and from some canals.



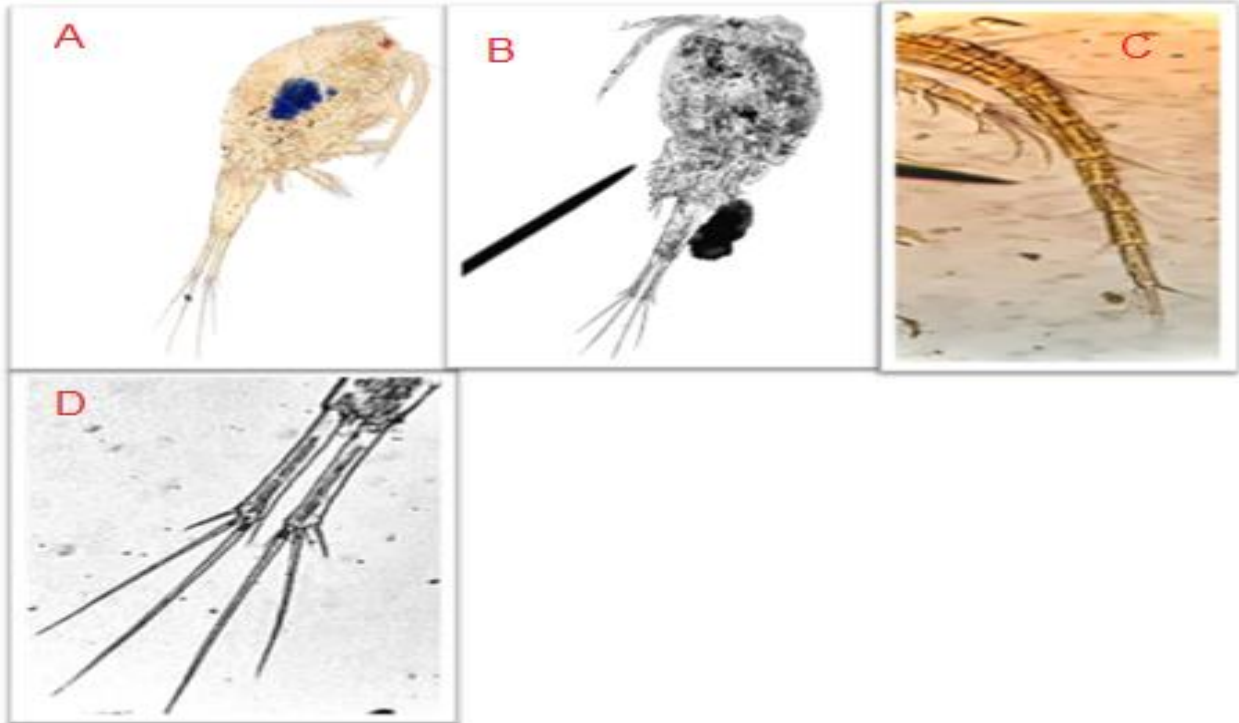
**Fig. (1)** A-Male 60 X; B- Female 100 X; C- caudal rami of male 200 X; D- caudal rami of female; and E- antennae 200 X of *Mesocyclops ogunnus*.



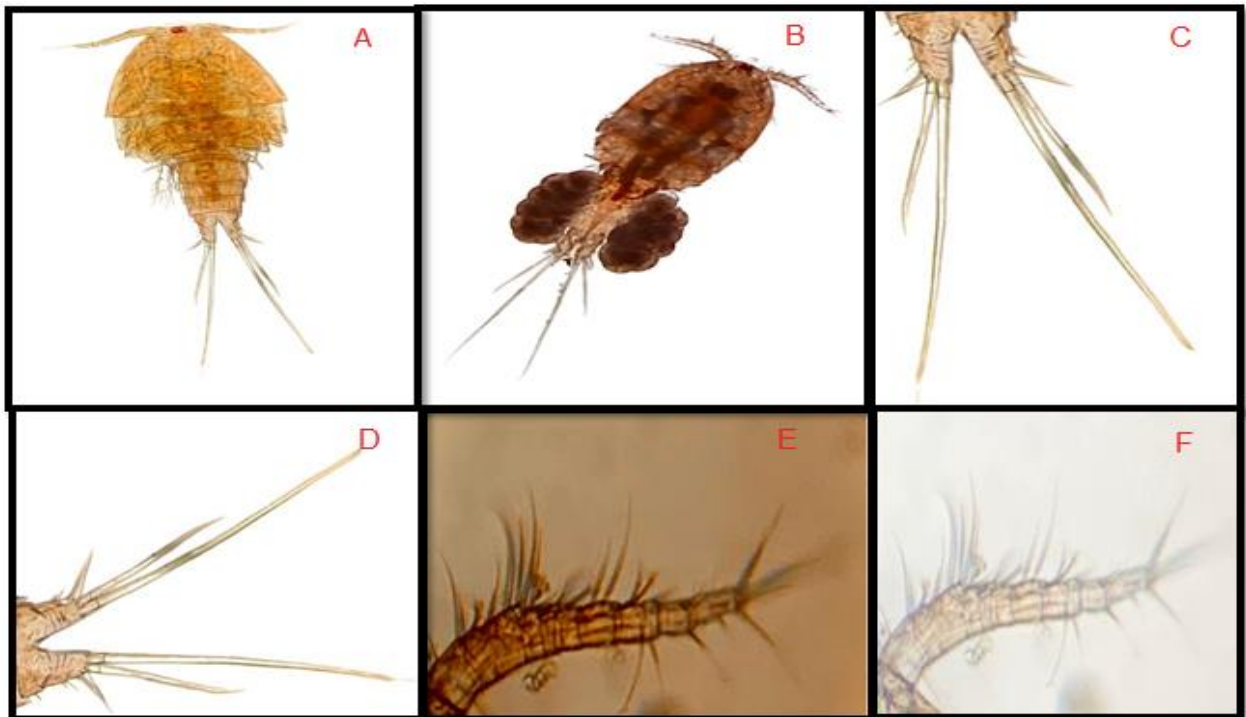
**Fig. (2)** A-Male 60 X; B- Female 60 X; C- antennae 200 X; D-caudal rami 200 X of *Macrocyclus albidus*.



**Fig. (3)** A-Male 100 X; B- Female 200 X; C- Side view explain legs 200 X; D- antennae of female 400 X; and E-caudal rami 800 X of *Eucyclops serrulatus*.



**Fig.(4)** A-Male 200 X; B-Female 200 X; C- antennae of male 400X; and D- Caudal rami 400 X of *Afrocylops gibsoni*.



**Fig. (5)** A-Male 200 X; B-Female 200 X; C and D-Caudal rami 400 X; E- and F - antennae of male of *Ectocyclops phaleratus*.

**Table (1):** Distribution of different species at different localities in Minia governorate

Locality	Dafash	Aboissa	AbiYaqoob west	Shalaby	Om sant
<i>Afrocylops gibsoni</i>	-	++	-	-	-
<i>Ectocylops phaleratus</i>	-	++	+	-	-
<i>Eucyclops serrulatus</i>	-	++	+	-	-
<i>Mesocyclops ogunnus</i>	++	-	-	+	+
<i>Macrocylops albidus</i>	++	-	-	++	+

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## الملخص العربي

### حصر وتعريف مجدافيات الأرجل في بيئات مائية مختلفة في محافظة المنيا

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تم جمع عينات من البرك والقنوات والمصارف المختلفة من مراكز محافظة المنيا من أجل التعرف على أنواع مجدافيات الأرجل. وقد إتضح وفقاً لمفاتيح التصنيف المختلفة لمجدافيات الأرجل تطابق الصفات الشكلية لمجدافيات الأرجل التي تم مسحها مع خمسة أنواع تنتمي إلى عائلة Cyclopidae موزعة في محافظة المنيا وكانت هذه الأنواع هي *Afrocyclops gibsoni* و *Ectocyclops phaleratus* و *Eucyclops serrulatus* و *Mesocyclops ogunnus* و *Macrocyclus albidus*. كان من الواضح أن الأنواع التي تم مسحها من Cyclopoids تختلف في تواجدها من مكان إلى آخر في جميع أنحاء محافظة المنيا وكانت *Mesocyclops ogunnus* و *Macrocyclus albidus* هي الأنواع الأكثر تواجداً في مواقع القنوات المائية في ثلاث قرى هي دفش وشلبي وأم سانت.

