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Biological Control of Mosquitoes Using Copepod Species in Benin City, Edo State, Nigeria

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ABSTRACT: Two aquarium tanks labelled A and B were each half filled with water. They were kept open outside the laboratory for seven days so that mosquito larvae will develop in them. Then plankton samples were collected from Ikpoba dam with two plankton nets of 55µm and 100µm mesh sizes. Copepod species were sorted out from the plankton samples and poured into tank A, while tank B was left alone as control. The two tanks were examined after five days. Results showed that the copepod species have eaten up all the mosquito larvae in tank A while in tank B, mosquito larvae were seen in abundance. Thus, copepod species can be used as a biological control of mosquito larvae in our ditches and stagnant pool of water in the environment.

Keywords: Biological control, Mosquitoes, Copepods, Species

Introduction.

Copepods are invertebrates belonging to the phylum: Arthropoda; Class: Crustacea; Order; Copepoda. Studies on copepods attract interest for several reasons. In the field of medicine some species of copepods of the Cyclops group are known to be vectors of the Guinea worm disease (*Dracunculus medinensis*). In the field of aquaculture and fisheries some copepod species are grown to supplement fish feed (Hansen, 2017). In ecological studies many herbivorous copepods play a pivot role in the food web of most of the bigger aquatic animals at the secondary production level. Few copepod species are also known to be carnivorous, feeding on insects larval forms. In 2020, Ebido *et al* contributed to knowledge on species diversity of cyclopidae copepods in the freshwater ecosystems of Southeast Nigeria.

A search on the internet and available literature showed that no work has been published on the use of copepods as a biological control of mosquitoes in Nigeria. This paper intends to contribute to knowledge of using copepods as a biological control of mosquitoes in the environment. It is an application of basic knowledge on copepods to solve environmental problem.

Materials and Methods

Study area: Ikpoba Dam which is located between Latitude 6^{o}N and 7^{o}N (Fig.1) was the sampling station where the copepod species were collected from. The experiment on the mosquito larvae and copepod species was carried out at the laboratory in the University of Benin.

Procedure: Zooplankton samples were collected from Ikpoba dam using two plankton nets of 55µm and 100µm mesh sizes. Carnivorous copepod species were sorted out from the zooplankton sample and kept in a big jar.

Identification of the copepod species was made using the works and keys of the following authors; Kiefer (1933), Onabamiro (1952), Green (1962), Robinson and Robinson (1977), Jeje and Fernando (1986), Karanovic (2004). Drawing of the copepod species (Fig. 2) was made using research microscope with camera lucida OLYMPUS VANOX model 204700. Prior to the zooplankton sampling; two aquarium tanks labelled A and B were each half filled with water and kept open outside the laboratory for mosquito larvae to develop in them. After seven days, mosquito larvae were seen wriggling in the two tanks. Then copepod species were poured into tank A while tank B was left alone as a control. After five days, the two tanks were examined.

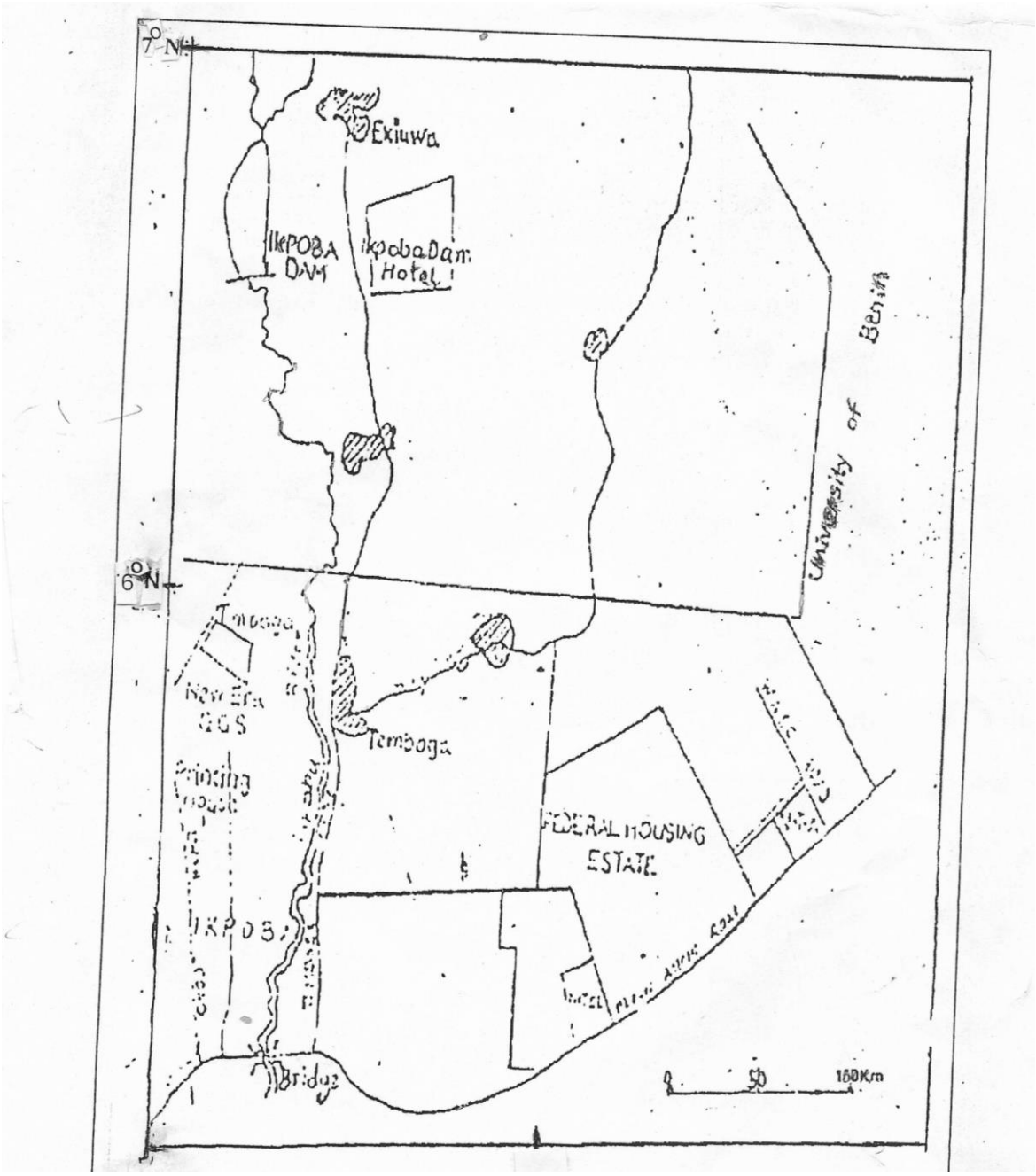

Figure 1: Map of the study area

Results

Mosquito larvae were seen wriggling inside aquarium Tank A which was half filled with water and left open outside for 7 days.
Mosquito larvae were also seen wriggling inside aquarium Tank B which was half filled with water and left open for 7 days.
Mosquito larvae became absent in Tank A after copepod species had been poured into it and left for 5 days. Only copepod species were seen.
Mosquito larvae were seen in abundance in Tank B where copepod species were not poured into.

Figures 2-4 are diagrams of some carnivorous copepod species and their mandibular palps.

Figure 2 shows a carnivorous copepod species and its mandibular palp. Number 2 in the figure (arrowed) is the mandibular palp which is fortified with setae and strong spines for seizing and tearing preys.

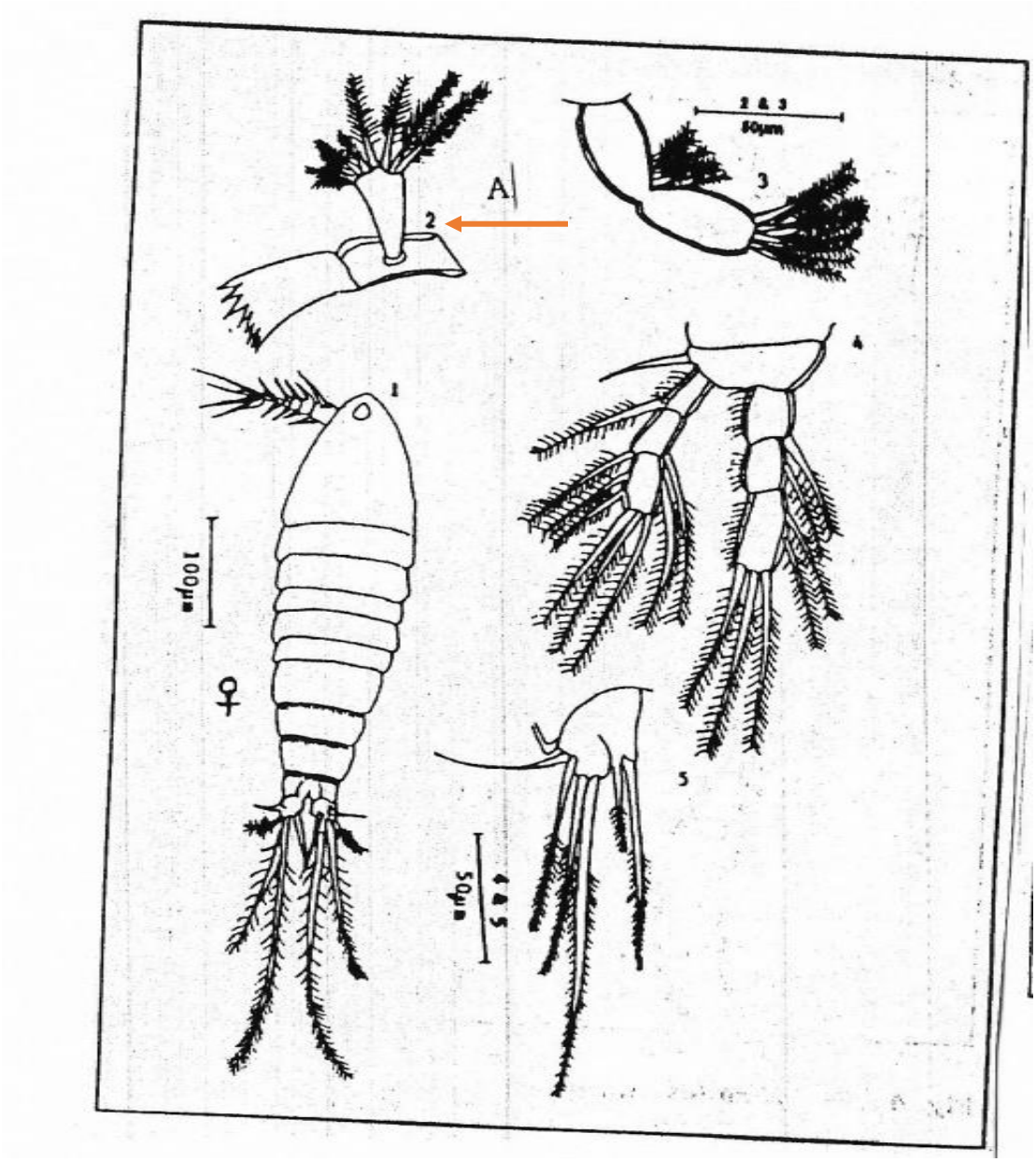

Figure 2: Diagram of a carnivorous copepod species and its mandibular palp

Figure 3 shows a carnivorous copepod species and its mandibular palp. Number 3 (arrowed) in the figure is the mandibular palp which is fortified with setae and strong spines for seizing and tearing preys.

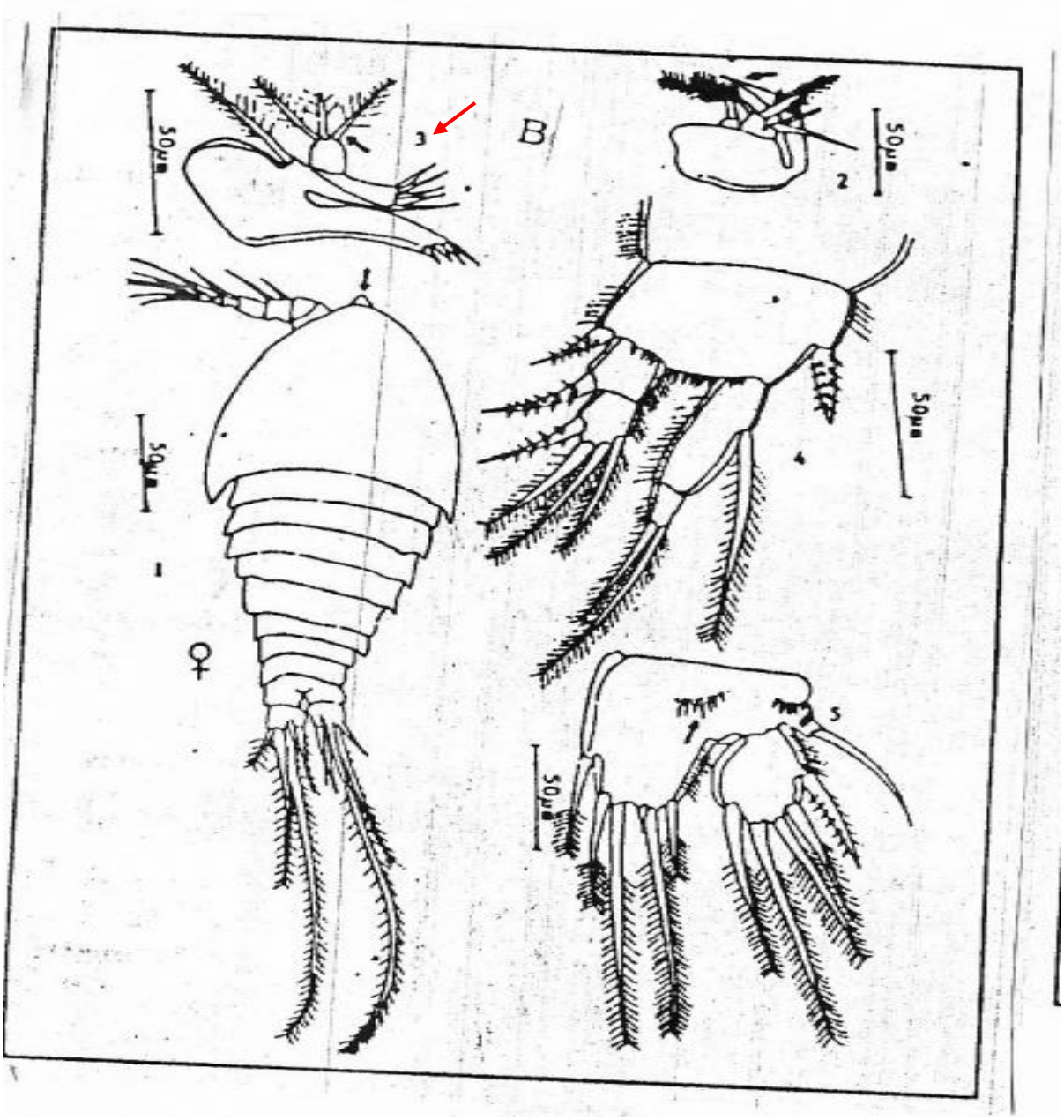

Figure 3: Diagram of a carnivorous copepod species and its mandibular palp

Figure 4 shows a carnivorous copepod species and its mandibular palp. Number 4 (arrowed) in the figure is the mandibular palp which is fortified with setae and strong spines for seizing and tearing preys.

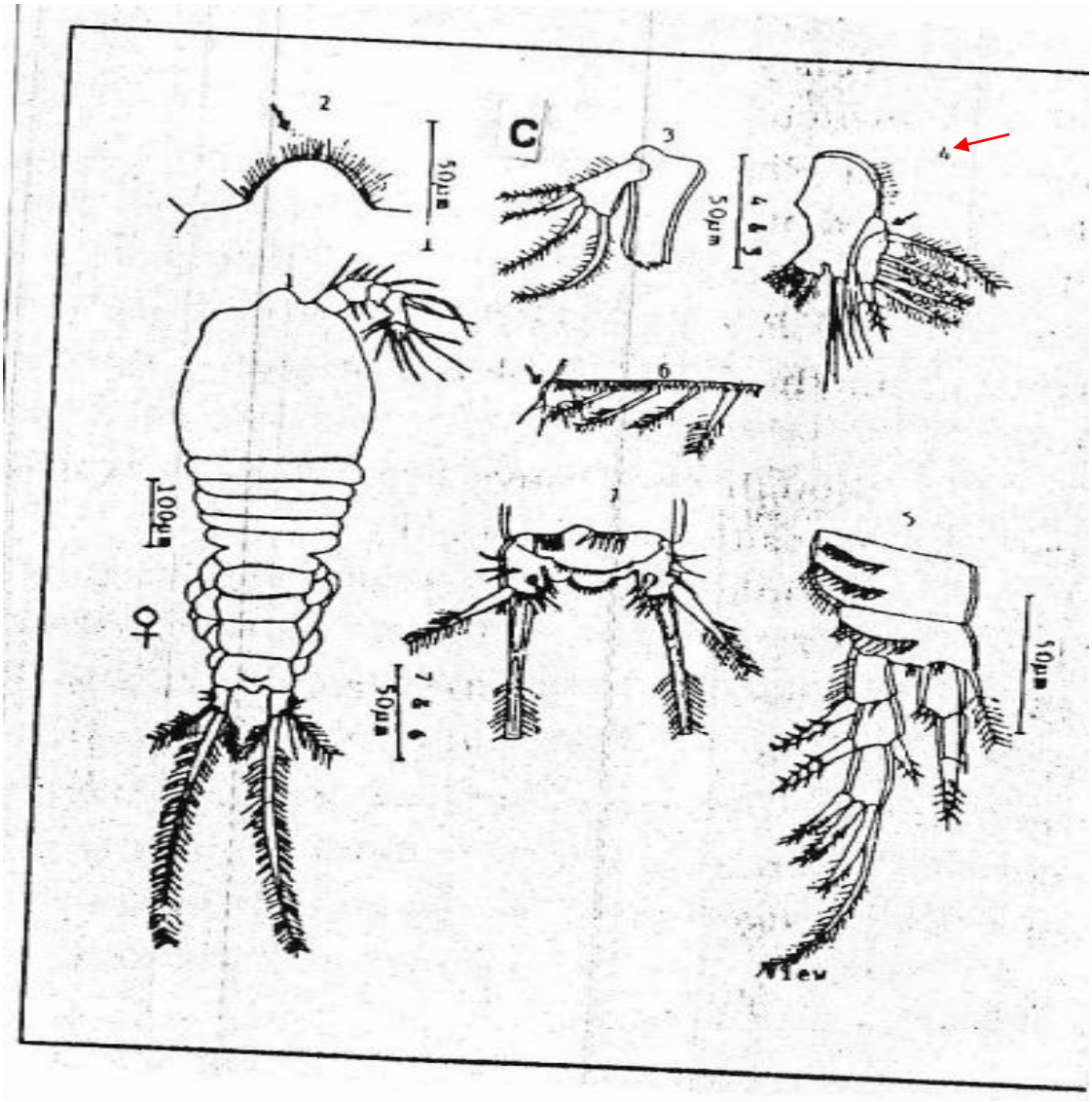

Figure 4: Diagrams of some carnivorous copepod species and their mandibular palp.

Discussion

The results show that carnivorous copepods species can be used as a biological control of mosquitoes in our ditches and pools of stagnant water in the environment. The control of the mosquitoes also helps to reduce the incidence of Malaria fever, because mosquitoes are the vectors of the parasites that cause Malaria fever. Biological control has been used at the International Institute for Tropical Agriculture, Ibadan, Nigeria (IITA) by Klopez and Elzein (2013) to control weeds in cowpeas farm.

Nafiu *et a*l. (2016) gave a review of biological control of insect pests on citrus plants. Van Lenteren *et al* (2018) used invertebrates and microorganisms for biological control of pests instead of using pesticides during their agricultural practice in North America.

This paper has also contributed to knowledge on biological control.

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