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SAMPLING AND COUNTING ZOOPLANKTON OF LAKE TANGANYIKA

by

I. VUORINEN*

* Dr. Ilppo Vuorinen is the Director of the Archipelago Research Institute, University of Turku, Turku, Finland.

FINNISH INTERNATIONAL DEyELOPMENT AGENCY

FOOD AND AGRICULTURE ORGANIZATION
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PREFACE

The Research for the Management of the Fisheries on Lake Tanganyika project (Lake Tanganyika Research) became fully operational in January 1992. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA).

This project aims at the determination of the biological basis for fish production on Lake Tanganyika, in order to permit the formulation of a coherent lake–wide fisheries management policy for the four riparian States (Burundi, Tanzania, Zaïre and Zambia).

Particular attention will be also given to the reinforcement of the skills and physical facilities of the fisheries research units in all four beneficiary countries as well as to the build–up of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

Prof. O.V. LINDQVIST
Project Scientific Coordinator

Dr. George HANEK
Project Coordinator

LAKE TANGANYIKA RESEARCH
FAO
B.P. 1250
BUJUMBURA
BURUNDI

Telex: FOODAGRI BDI 5092

Tel.: (257) 229760
Fax.: (257) 229761

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Series of **technical docuuents (GCP/RAF/271/FIN-TD)** related to meetings, missions and research organized by the project.

Series of **field guides and manuals (GCP/RAF/271/FIN-FM)** related to training and field work activity conducted in the framework of the project.

For both series, reference is further made to the document number **(01)**, and the language in which the document is issued: English **(En)** and/or French **(Fr)**.

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1. INTRODUCTION

In pelagic zooplankton community of Lake Tanganyika there are four important groups, each containing one species i.e.:

a protozoan: *Vorticella*;

a calanoid copepod: *Tropodiaptomus simplex* (FIGS. 1—4);

a cyclopoid copepod: *Mesocyclops aequatorialis* male (FIG. 5) and female (FIG. 6)

Furthermore, caridean shrimps and a medusa *Limnocnida tanganyicae* (FIG. 7) may be important locally.

Studies of the interactions between the plankton community, the pelagic fish community and the predator-prey system should provide information to answer the following questions:

1. **What is the biological basis for pelagic fish production in Lake Tanganyika?**

2. **How would pathways of carbon change in the pelagic ecosystem if the present composition and abundance of fish stocks change?**

3. **What are the ecological interactions and adaptations that control the pelagic carbon flow and how they are changing in the present situation?**

and specifically concerning zooplankton:

4. **Are there regional differences in the distribution, patchiness and vertical migration of plankton community?**

5. **Do predators influence the distribution pattern and migration pattern of plankters? and**

6. **How the abundance and production change seasonally, and are these changes connected to lunar cycles?**

2. SAMPLING ZOOPLANKTON

2.1 Checklist of gear for sampling:

- Limnos (7 liter) tube sampler with a rope (10 m markings) and the messenger;
- plankton net (50 µm and 100 µm);
- bottles (100 ml);
- waterproof marker;
- formalin (48%);
- syringe; and
- buckets (2).

2.2 Checklist of gear for counting

- inverted microscope with counting chambers for mesozooplankton;
- dissecting microscope with counting trays for larger plankton (medusae and shrimps);
- identification manual;
- forms;
- multi–channel counter **(with a voltage regulator: counter is using 110 V**); and
- Folsom sample splitter.

2.3 Sampling schedule

Zooplankton sampling programme is associated with the limnological sampling in each LTR field station. Consequently, liinnological sampling schedule must be consulted. Basically, sampling consists of (1) a weekly sample from each station which is taken by vertically towing 100 µn plankton net from 100 meters depth to the surface (speed of the net is 0.5 m/s) and (2) a 24-hour sample/each month, which is done using the tube sampler and 50 µm net. One tube is taken at each 10 meters down to 100 m and at 120 and 140 m.

The sampling is intended to cover all seasons and stratification periods: mixing period, shallow stratified and deeply stratified. Night-time samples should include a sample taken shortly after dark in order to sample the zooplankton population which is available for selective fish predation. Sampling will also cover different phases of the moon.

In sampling with both the net and the tube sampler, the net containing the sample is first emptied to the sample bottle (100 ml) through the hose. After that the net is rinsed by dipping it to the bucket containing pre-filtered water. The cod-end will fill with water which is again emptied into the bottle. Rinsing is done three times after which the sample bottle will be almost full, but enabling still the addition of formalin. Each sample is preserved with 4 ml of 40 % formalin/100 ml sample. The bottle is labeled with a waterpoof marker (date, location, depth sampled, net used and initials of the sampler).

It is essential to: (1) check the locking of the lover lid of the tube sampler; (2) that the hose in the net is closed; (3) that the tube sampler is not leaking; (4) that the hose in the lower end of the tube is closed; and (5) that the rope is going vertically down when the messenger is released.

After sampling the net is gently washed in lukewarm water and dried in shade.

2.4 Subsampling

Subsainpling is made in order to reduce the number of counted individuals without a trade-off in reliability. A good “rule of thumb” is to have at least 100 individuals/sample for either the inverted microscope or the dissecting microscope.

2.4.1 Microzooplankton, copepods

The volume of the sample is measured by weighing it (empty 100 ml sample bottle weighs 12.9 g). The sample is thoroughly rinsed by turning it continously up and down for one minute. Then the subsample is poured directly to the counting chamber.

The counting chamber must be filled so that the water level is somewhat (1—2 mm) over the rim of the chamber. The chamber is allowed to stay open for a few minutes for excess gas to come out before sliding a lid from the side over the chamber in order to remove possible gas bubbles.

The chamber should then stay overnight or at least three hours for sedimentation to take place. A drop of water is added in order to remove gas.

2.4.2 Macrozooplankton. medusae and shrimps

Dissecting microscope is used when counting medusae and shrimps i.e. macroscopic animals. If a sample contains less than 200 individuals one must count the whole sample. If the sample contains over 200 individuals it must be subsampled. After little practice one will learn to estimate the number of animals in a sample.

Folsom sample splitter divides the sample into two equal parts. A record is kept as to which part of the original sample goes to counting (1/2, 1/4, 1/8 etc). After each split there will be some animals attached to the walls of the splitter and thus the splitter should be rinsed carefully.

3. COUNTING AND FILLING IN THE FORM

Photographs of the most abundant identification units are included in this manual (pages to). In using the electronic counter the most abundant items e.g. nauplii and copepodids of cyclopoids should be under an index and middle fingers. A counting form must be filled for each sample, one copy of it should be stored in the stations and one sent to the zoo-plankton sub-component field leader (= Heini Kurki at LTR/ Kigoma). A model of completed form is now given in Appendix 1 (List of Data Sheets).

Sampling bottle volume/chamber volume will yield k for chamber and K for Folsom is the reciprocal of Folsom fraction. If one finds species which are not occasional and not found in the form, the identification manual should be consulted. If that doesn’t help a working name is given and sample preserved for later identification.

During the training course in zoo—plankton, it appeared difficult to keep apart fifth and sixth copepodid stages of the cyclopoids; they should therefore be counted as one unit. In keeping apart calanoid and cyclopoid nauplii one should: (1) look for general shape (elongated in calanoids, round in cyclopoids); (2) distinct “nose” between the antennae (to be found in calanoids, but not in cyclopoids); (3) length of antenna I (longer than antenna II in calanoids while in cyclopoids it is shorter than antenna II); (4) distal segment of antenna (flattened and lined with hairs in calanoids, pointed with hairs at the tip in cyclopoids); and (5) caudal hairs (strong and pointing directly backwards in calanoids and weak, pointing slightly outwards in cyclopoids).

4. PREPARING A DATABASE

Four data sheets have been prepared and are presented as follows:

Data sheet No.1: Quantitative plankton sampling
Data sheet No.2: Qualitative plankton sampling
Data sheet No.3: 24 hours monthly sampling with 50 µm net
Data sheet No.4: weekly sampling with 100 µm net

FIG. 1 : *Tropodiaptomus* female showing the fifth leg and a nauplius larva.

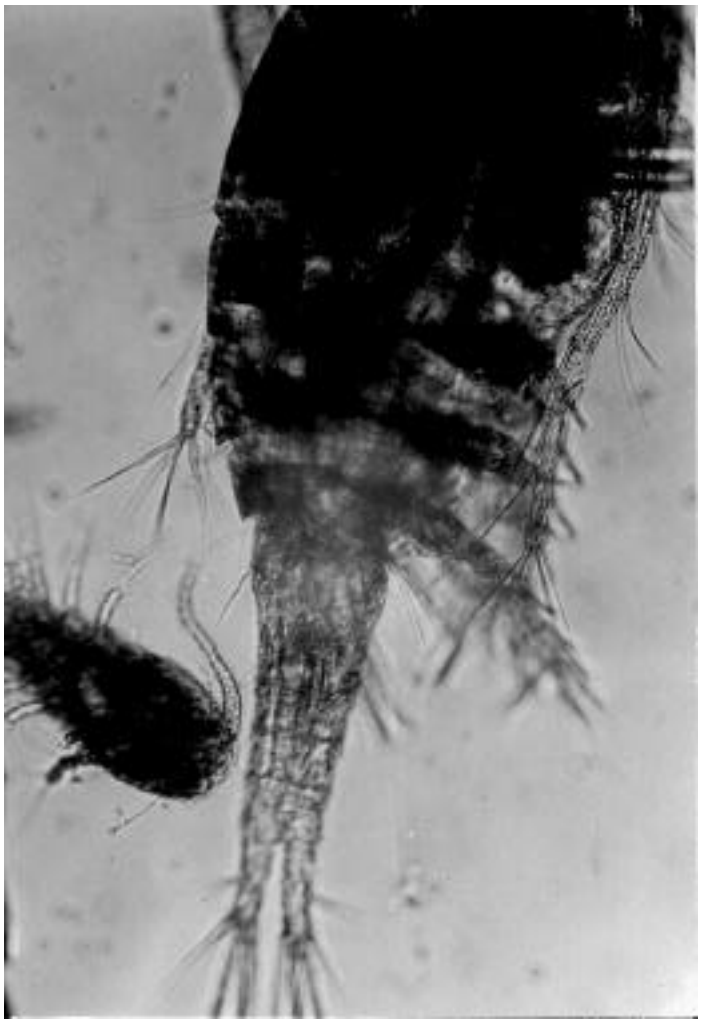

FIG. 2 : *Tropodiaptomus* male showing the fifth leg and jointed right antenna I.

FIG. 3 : *Tropodiaptomus* copepodid

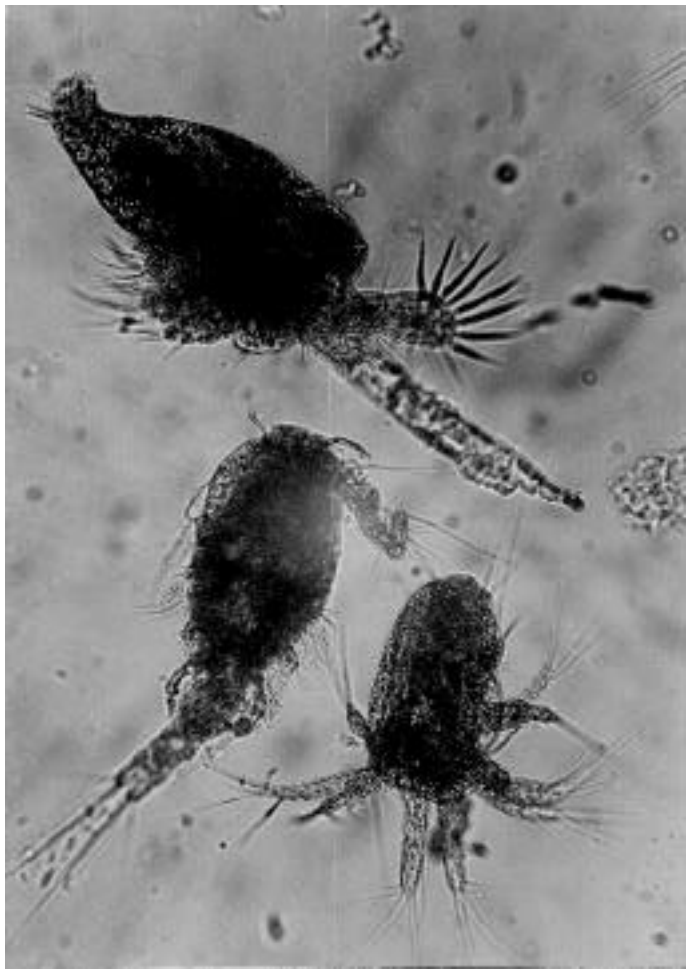

FIG. 4 : Tropodiaptomus nauplius showing the lateral hairs of the first antenna witha cyclopoid nauplius and a male copepodid.

FIG. 5 : Cyclopoid male showing jointed first antennae

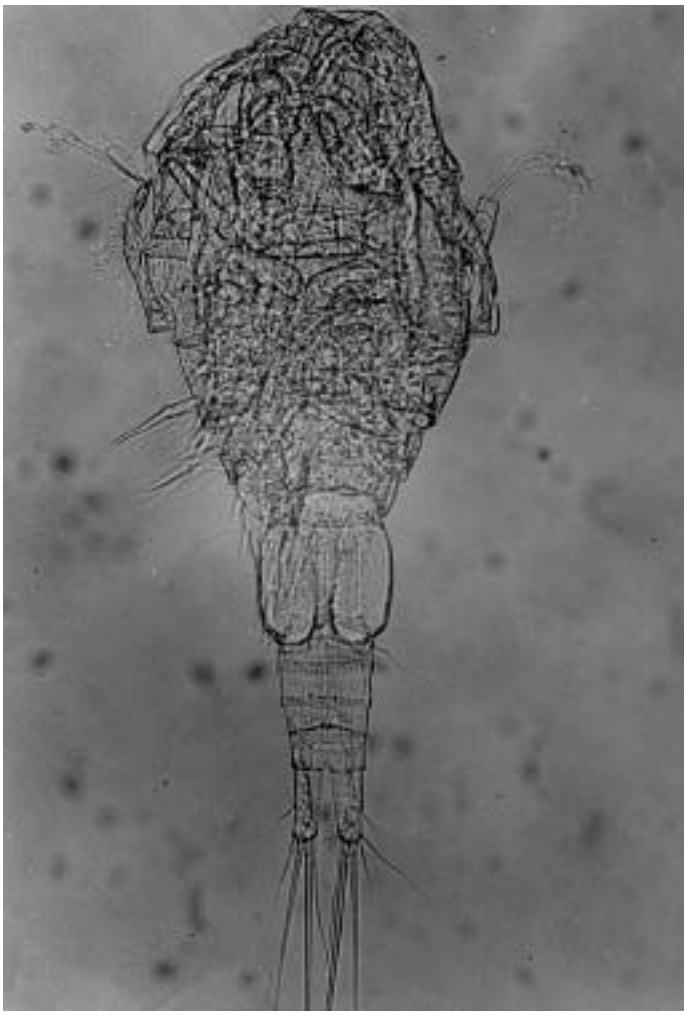

FIG. 6 : Cyclopoid female

FIG. 7 : Shrimps with medusae with 1 FRB

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Quantitative plankton sampling

Date: **Hour:** **Location:** **Depth:**

Net: **µm**

Sample volume	chamber volume	k for chamber	Folsom fraction	k for Folsom

Species	k	Individuals/Chamber or fraction	Individuals/ sample	Individuals/m3
Tropodiaptomus				
male				
female				
ovigerous female				
copepodid				
nauplius				
Mesocyclops				
male				
female				
ovigerous female				
copepodid				
nauplius				
Limnocnida				
Others				

Remarks: _____

_____

_____

Name: _____

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Qualitative plankton sampling

Date: **Hour:** **Location:** **Depth:**

Net: µm

Sample volume	chamber volume	k for chamber	Folsom fraction	k for Folsom

Species	k	Individuals/Chamber or fraction	Individuals/ sample	Individuals/m3
Tropodiaptomus				
male				
female				
ovigerous female				
copepodid				
nauplius				
Mesocyclops				
male				
female				
ovigerous female				
copepodid				
nauplius				
Limnocnida				
Others				

Remarks: _____

_____

_____

Name: _____

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Zooplankton database, 24 hour monthly sampling with 50 µm net

Year	Month	Hour	Location	Depth	Tropodiaptomus	male	female	ovigerous female

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Zooplankton database, weekly sampling with 100 µm net

Year	Month	Hour	Location	Depth	Tropodiaptomus	male	female	ovigerous female