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**Title: Fisheries and limnological patchiness: An Investigation between Water Parameters and Fishing Results in Lake Tanganyika**

### **Introduction**

In Lake Tanganyika, a fishing vessel commonly ranges from night to night within an area of about 50 km<sup>2</sup>, and catch variation should be considerable if *Stolothrissa* distribution is discontinuous within such an area. This appears likely.

The acoustic survey of the Lake Tanganyika (Johannesson, 1975) showed biomass to be highly variable among 3.7 km survey tracks.

The uneven distribution of nutrients (nitrogen, phosphorus) is largely the consequence of the existence of thermal stratification in the Lake. Fluctuation in the existent stratification determines the degree of nutrient influx into the photic zone. The waves, mainly detected below the thermocline influence thermocline depth and the "Nutrient waves" might influence organisms adapted to capitalize on episodic events.

We are hypothesizing that there could be some relationship between fish patchiness, algal patch distribution and uneven distribution of nutrients.

### **Objective**

The objective is to see if there is a relationship between variability of the fishing catch and spatial / temporal variability of the water parameter / zooplankton.

### **Materials and Methods**

A comparison of the water parameters and fishing results of separate sampling units was used to study patchiness in the Kigoma Basin of Lake Tanganyika. Our group used a 12-meter research vessel, R/V Echo, to tow a catamaran fishing unit and fisherman to a site of their choice. Fishing is done at night, so the study data was collected on 4 different nights over a 2- week period between mid-June and mid-July 1988. A total of 7 sites were sampled with 4 of the sites in pelagic areas and 2 near shore areas of the lake.

Fishing units (one catamaran and one lift net) usually consist of 2 boats and 4 to 6 fishermen. The fisherman's equipment generally consists of pressure lamps, used to attract the fish the first 2 to 3 hours at a site, a type of net and poles to haul in the net. Our research vessel was situated a shouting distance from the fishing unit. The GPS location was recorded then water sampling and physical measurements were begun about 1 hour before fishermen began hauling their nets.

### **Physical Parameters**

One-liter water samples were taken from the surface of the lake and at 10, 20, 40, 60, 80 and 100 meters. Water temperature was measured every 10 meters to a depth of 60 meters and then at 80 and 100 meters by using a portable temperature and dissolved oxygen probe with a stirrer. Turbidity was measured the next day in the lab using a portable turbidimeter (Model 2100P, Hach Co.) Water samples that were analyzed in the lab were kept at 4°C in the field and frozen upon return to the lab. Analyses were performed within 24 hours of collecting the samples. The number of pressure lamps used to attract the fish was noted along with the moon phase, since it is known that a strong moon presence will inhibit the ability of the lamps to attract fish. The first sampling was during a new moon and last during ½ moon phase.

### **Chemical Parameters**

Conductivity measurements for presence of salts in the water were taken at the site using a conductivity/TDS meter (Model 446000 Hach Co.) Measurements for water pH were conducted at the site also using the portable conductivity/TDS meter. Dissolved oxygen concentrations were taken at the site with a portable oxygen probe. The instrument was calibrated by correcting for altitude and temperature at Lake Tanganyika. Analysis for nitrates and soluble reactive phosphorus were done next day in the lab using the cadmium reduction method and test N tube method (Hach Co.) The concentration was measured spectrophotometrically.

### **Biological Factors**

Zooplankton levels in the water column were studied by using either a 53 micron or 102 micron mesh net and collecting from a vertical depth of 20 meters. The sample was preserved in a solution of 1:1 distilled water and 10% formalin. The number of zooplankton was counted in a 1ml aliquot of the sample.

After each haul, a random sample of the catch was collected. The total weight of the fish catch was estimated. The type and % of each fish species in the random sample was recorded along with measurements of mass and length for each fish in the sample.

### **Preliminary Results**

#### **Physico-chemical Parameters**

##### **Temperature**

There is a remarkable temperature variation from one day to another during the course of sampling. Temperature seem to be decreasing from the first day to the last. The thermocline depth decreased from 60 m on the first day to 40 m on the last days.

## **Turbidity**

Turbidity shows a positive increase from first day until the last day (between 0 m and 60 m) in the offshore sampling. However, it was also observed that on the first and second day, turbidity at the near-shore area was greater than at the offshore area. (Fig.1).

## **Conductivity**

Conductivity during the first and second days remained constant down to 60 m, while the third and fourth days the conductivity was constant at 40 m. (fig.1.)

## **pH:**

The pH-cline on first day was at 60 m, the second day was at 50 m. On the third and fourth days, it was at 40 m. but pH increases at this depth.

## **Dissolved Oxygen**

The oxycline on first day at the offshore was at 60 m and on the third and the last days of the sampling was at 50 m.

## **Reactive Phosphorus**

Soluble reactive phosphorus seems to be completely mixed but there was an increase in concentration from the first to the last day of sampling. (Fig.1.).

## **Nitrate**

The nitrate chemocline was at 40 m the first and the last days, at 60 m the second and the third days of sampling. There is an increase in concentration with depth from the first to last day at the chemocline.

## **Zooplankton abundance**

The number of zooplankton captured increased linearly through the sampling period. (Fig.2).

## **Fishing**

The fish catch was evenly distributed for the whole period of sampling. (fig.3c). The *L. stappersii* (adults) catch was high at the first beginning, but started to drop off, being replaced by catches of *Stolothrissa* and *L. stappersii* (juveniles).

## **Discussion**

It seems that the temperature, thermocline, chemocline changed between the first day and the last day of sampling

from 60 to 40 m depth. This could be due to internal waves. The turbidity, D.O., PO<sub>4</sub>-P concentrations increased greatly while conductivity showed a slight increase. These conditions slightly favored an increase in number of zooplankton and total catch of fishes. This is clearly shown by the fish catch.

## **Conclusion**

The fish catch trend shows that there may be a relationship between variability of the fishing and spatial and temporal variability of the lake waters and zooplankton. However, these data are preliminary and the analysis should be extended before reaching any strong conclusions.