WORKSHOP REPORT

ON

THE FISHERIES RESEARCH ON LAKE NABISOJJO – LUWERO DISTRICT

LUWERO COUNCIL HALL: 14 December, 2000
Introduction

Invertebrates are organisms without a backbone. On the basis of body size, aquatic invertebrates can be divided into two broad categories: micro- and macro-invertebrates. The former, commonly known as zooplankton, ranging in size from <100um to ca. 1500um and are mainly planktonic (i.e. living suspended in the water column). The latter, also known as benthos (bottom dwelling) are associated with bottom sediments (i.e. living on sediment surface or burrowing in sediments), are much bigger organisms greater than 1500um in body size.

The zooplankton community in most Ugandan water bodies are commonly dominated by micro-crustacea or insect-like organisms of which there are two bread categories: copepods (with elongated segmented bodies and posterior terminal hairs or setae and two pairs of antennae at the anterior end) and cladaceans also known as water fleas (characterised by bivalve, rounded bodies and large multi-lensed eyes). Also found in some water bodies are the red shrimps (or prawns) comprising one species Caridina nilotica. The latter are not strictly planktonic due to their diurnal migratory patterns, living close to bottom sediments during the day and ascending to surface waters by night. Among non-crustacean zooplankton, Rotifera or Rotatoria are prominent. These are minute organisms generally < 100um with elongated bodies without segmentation and with head, trunk and feet indistinguishable. The majority live in shallow nearshore habitats with submerged macrophytes (littoral zone). Other common members of zooplankton are the larval stages of aquatic insects particularly the genus Chaoborus and occasionally some water mites. Like the shrimps, chaoborid larvae also migrate to surface water at night and descend to the bottom sediments by day.

The macro-invertebrate community consists of larval stages of chironomids (true midges) and chaoborids (phantom midges) and Ceratopogonids (biting midges). Other commonly found aquatic insects are caddisflies, beetles, dragonflies, mayflies, and stoneflies etc.

Invertebrates derive their importance in aquatic systems from their role in fish nutrition and nutrient cycling while others can be used as bio-indicators in monitoring of environmental health. All fish larvae, regardless of species utilise a diet of zooplankton as the first external food. In this regard, zooplankton can be conceived as being analogous to milk as the first and ideal external food for human babies. The survival of fish larvae and subsequent recruitment into the fishery is therefore, to a great extent, linked to the occurrence and abundance of suitable invertebrate food organisms. In many lakes the production of some commercially important fish species (like mukene and some haplochromines or Nkejje in Lake Victoria) depends entirely on consumption of zooplankton. Many macro-invertebrates have been reported to constitute sizeable fractions of commercial fish species including the Nile perch, *Lates niloticus* (Greenwood 1966). Therefore fishery production dynamics cannot be fully appreciated without understanding the role of important inputs including a host of invertebrate organisms. Like other biological components, the occurrence, survival and sustenance of aquatic invertebrates is influenced by the state of the water environment with respect to its physical, chemical and biological characteristics. Alterations in these environmental aspects may often be manifested in corresponding changes in the occurrence, distribution and abundance of invertebrate species, which in turn affects the fish communities that depend on them.

The main aim of this study was to investigate the composition, distribution and abundance of invertebrate organisms in Lake Mabirizi, assess their potential trophic interactions with the fish community and ultimately their role in fishery production of the lake.
Materials and Methods

Field sampling was carried out once during August 2000. The lake was divided into three transects covering as much of the lake as possible. Along each transect, two sampling points: edge (5-10 metres away from the shoreline) and middle (approximately mid-way between opposite lake edges) were established.

Zooplankton were sampled with a Nansen type net of 60um mesh size by taking 3 vertical hauls from ca.0.5 metres above the bottom sediments to make a composite sample for each sampling point. Samples were preserved in 4% sugar-formalin solution. In the laboratory, each sample was diluted with tap water to a suitable volume and sub-samples were taken from a well-agitated suspension with a bulb pipette. Each sub-sample was placed on a plankton-counting chamber and examined under an inverted microscope. Organisms were identified using available taxonomic keys and enumerated by species. From the count data, estimates of abundance were calculated.

Macro-invertebrates were sampled with a ponar grab. Three mud grabs constituted a composite sample. Each sample was sieved through a 400um nitex mesh and preserved in 70% ethanol. The samples were examined under a binocular microscope. The organisms were taxonomically identified and counted.

Results

Zooplankton

Community Composition

The zooplankton community in Nahibujjo comprised Crustacea, consisting of two broad categories: copepods and cladocerans (Table 1). Among non-crustaceans were Rotifera and larval stages of insects particularly the genus Chaoborus. The copepods were composed of one genus (type), Thermocyclops, which consists of two species (sub-types), namely Thermocyclops neglectus and T. incisus. Young stages of these copepods (nauplii, larvae and copepodites) were also commonly found. The water fleas were represented by a single species, Monodaphnia. Several genera and species represented Rotifera. The key genus was Brachionus comprising 4 species while Filinia had two species. Other genera (Asplanchna, Keratella, Lecane, Polyarthra, Synchaeta and Trichocerca) had 1 species each. There was no clear distinction in community composition between transects and between edge and middle sampling points.

Distribution

Three groups of zooplankton were clearly distinguishable in terms of their distribution characteristics (Table 1). One group comprising Brachionus angularis, B. falcatus, Filinia longiseta and Polyarthra vulgaris (rotifera), Thermocyclops neglectus (copepoda) and Monodaphnia (Cladocera) exhibited lakewide distribution and were nearly always encountered in all the samples collected. The second category comprised organisms with a 50% chance of finding or missing them in the samples. These comprised B. calyciflorus, Lecane bulla, Trichocerca cylindrical and Thermocyclops incisus. The third category was composed of organisms which were only rarely found in the samples including Asplanchna sp., B. bidens, Filinia longiseta, Keratella tropica, and Chaoborus larvae.

Abundance

Among the rotifers, the most most abundant organisms were B. angularis (20-50 ind/l), F. opolensis (10-50 ind/l). Of the copepods T. neglectus showed higher numerical abundance
(up to 30 ind./l) than *T. incisus* although very low abundance was quite common in several stations (Table 1). Nauplii larvae were the most abundant of the copepod category with > 100 ind./l in most sampling stations. *M. micrura* abundance was moderate (up to 8 ind./l) while *Chaoborus* larvae had very low abundance (0.4 ind./l). Numerical abundance for all organisms combined ranged between 170 and 280 ind./l and there were no marked differences between samples from the lake edge with those taken from mid-point positions.

**Species diversity**

The number of zooplankton species encountered in different transects averaged between 9 and 10 and there was no observable difference in number of species between the edge and middle sampling points (Table 1). Rotifer species group contained the highest number of species ranging between 4 and 8 species compared to 1 and 2 for copepods and a single species for Cladocera.

**Macro-invertebrates**

The macrobenthic community was composed of three taxa, namely the Chironomid larvae, *Chaoborus* larvae and Ceratopogonids (Table 2). Chironomids and Ceratopogonids were widely distributed but the former was the most abundant organisms (up to 700 ind./m²). Chironomids contributed between 80 and 90% of all the organisms encountered in the sediments. *Chaoborus* larvae were poorly represented and were not encountered in half of the samples. High areal densities were observed in transects 2 and 3 (up to 900 ind./m²) and between these two were negligible. There appeared to be a consistent trend in the horizontal distribution of chironomids, which in most cases occurred in much higher areal concentrations in the mid-points of the lake compared to the points at the lake edge.

**Discussion**

The results presented here are only preliminary as only one field trip was undertaken. However, the zooplankton community encountered represents a typical tropical assemblage, with few species in the different genera and small-bodied organisms as the dominant groups (Fernando 1980). One of the most striking differences between Nabisojjo zooplankton community and those in other Ugandan lakes is the low diversity of species in the few genera found among Copepoda, Cladocera and Rotifera. A maximum of 8, 2 and 1 species of Rotifera, Copepods and Cladocera were found respectively. Prominent constituents of most other aquatic systems such as *Mesocyclops* sp, (Cyclopoida) Diaptomids (Calanoida) and several cladoceran taxa were missing in these preliminary lake samples.

It is not clear how much the apparent low and time-restricted sampling effort may have contributed towards this observation. Further field sampling would therefore be necessary to obtain conclusive results about species composition and abundance. Observations made elsewhere have shown that most of the invertebrates encountered in Nabisojjo including *T. neglectus*, *T. incisus*, *M. micrura* and chironomid larvae constitute sizeable proportions in the diet of commercially important fishes and fish larvae (Mwebaza-Ndawula 1998, 2000; Greenwood 1966). Based on these preliminary observations, Lake Nabisojjo appears to have potential for supporting a range of fish species particularly those that utilise invertebrate organisms as a food source.

Low species diversity and abundance may be associated with high predation pressure owing to selective consumption practiced by fish predators (Brooks & Dodson 1965). It is however not clear whether the low diversity and abundance of invertebrates observed in Nabisojjo is related to predation effects or is a result of some limiting environmental factors such as low dissolved oxygen, pH, high conductivity etc. Further investigations with respect to trophic interactions between fishes and invertebrates are necessary for better understanding of these
phenomena and to determine the status of the invertebrate communities in relation to fishery production.

References


