

Zooplankton in the open water areas of Lake Cubhu, a freshwater coastal lake in Zululand, South Africa

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Abstract

A preliminary investigation of the zooplankton in the open water areas of Lake Cubhu, a shallow, freshwater coastal lake near Richards Bay was conducted on a monthly basis during 1988. Species densities and species richness in the lake were low. The zooplankton community comprised 15 taxa which were numerically dominated by 2 species of cyclopoid copepods, *Paracyclops poppei* and *Microcyclus crassipes*, throughout the year. Other than some minor fluctuations in densities between the 2 major cyclopoids species, no significant changes were evident in the community structure, numerical abundance or seasonal densities of the different species between sampling stations. Lake Cubhu follows a similar pattern to many other African subtropical and tropical coastal lakes in having very limited production. Chlorophyll *a* values measured over a 2-year period seldom exceeded 4 $\mu\text{g}\cdot\text{l}^{-1}$. The main factor limiting zooplankton numbers in the lake is a low primary productivity which can be related to clear, shallow water and a restricted nutrient input.

Introduction

Of the 4 freshwater lakes in the Richards Bay area, Lakes Nseze, Mzingazi and Nhlabane are all affected to some extent by industrial and urban development. Lake Cubhu, until recently, has been least affected and supplies water of a high quality to the town of eSikhawini. Rapid urban expansion in the lake catchment (Fig. 1) has, however, changed this situation as the demand from eSikhawini for domestic water is increasing as is the potential for eutrophication of the lake through storm-water runoff from the paved streets and buildings.

Knowledge regarding natural water bodies, especially freshwater coastal lakes, is particularly sparse in South Africa (Allanson et al., 1990). Information on the ecology of Lake Cubhu is confined to an unpublished report by the Durban Branch of the Division of Water Technology [formerly the National Institute for Water Research (NTWR)] of the CSIR dealing with water quality (Hemens, 1980), a preliminary investigation of the benthos (Cyrus and Martin, 1988) and an account of the species composition of the macrocrustacea (Reavell and Cyrus, 1989), and another by Schoonbee et al. (1989).

In view of its importance as a source of domestic and light industrial water, it is desirable to maintain the present high quality of the water. There is thus an urgent need for the establishment of a reliable data base on important ecological aspects of Lake Cubhu against which temporal changes may be assessed. The present investigation was aimed at obtaining estimates of the species composition, densities and distribution of the zooplankton in the open water areas as an essential step towards establishing baseline data against which any future changes in the structure of the zooplankton community can be compared.

Study site

Lake Cubhu (28°51'S 31°57'E) is a natural, shallow, freshwater system on the north coast of Natal (Fig. 1). The lake level was raised 1 m by the construction of an earth wall along its eastern

shore in 1979. The lake is presently about 3.5 m a.m.s.l. and has a water surface area of approximately 460 ha at a mean depth of 2.5 m. At full capacity the maximum depth does not exceed 4 m (Hemens, 1980). The surface outflow from the lake passes over a man-made weir at its NE corner and flows through a wetland area into the Southern Sanctuary of Richards Bay.

The lake catchment is about 80 km² and drains mainly into the Mzingwenya River which supplies most of the surface water input to the lake (Hemens, 1980). The catchment has an annual precipitation of 1 300 mm mostly falling during summer.

Three sampling stations in open water with depths greater than 2 m were selected for this study (Fig. 1).

Materials and methods

Plankton sampling

Samples were collected monthly during 1988 by means of a portable Yamaha YP20GN motorised water pump fitted with 50 mm flexible intake and delivery hoses. The pump was calibrated to deliver water at the rate of 437 $\text{l}\cdot\text{min}^{-1}$. The pump calibration was checked on each field trip and sampling commenced 1 h after sunset. Each plankton sample was collected by pumping water for 5 min through a 64 μm plankton net fitted with a collecting bottle. Surface samples were taken 200 mm from the surface and, in order to avoid taking up organic ooze, the bottom samples were taken 300 mm from the bottom. All samples were preserved in a 2% formalin solution for later analysis.

In the laboratory each sample was first concentrated to 500 ml from which 3 replicate subsamples of 2 ml each were extracted by means of a Stempel pipette and transferred to Bogorov sorting trays. Each subsample was analysed separately. No distinction was made between cyclopoid larval stages or species and all copepod larvae were simply counted as nauplii. Adult plankters were sorted to species level where possible and the density of each species at each site was expressed as animals m^{-3} . The entire sample was scanned for those zooplanktonic species which occur only in very low numbers. In order to clear the pump and 50 mm hoses of water from the previous sample the pump was first allowed to run for 3 s before the sieving of water began at each site.

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