Limnological study and management issues of *Oreochromis niloticus* (Linnaeus, 1758) culture ponds at Lake Harvest Farm, Kariba, Zimbabwe.

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ABSTRACT

The slow development of aquaculture in Africa has been attributed to challenges of poor water quality, high cost of fish feed and poor productive perfomance of cultured fish. Poor management of the fish ponds has been reported to be the major cause for poor water quality in fish ponds. Poor water quality in fish ponds affects productive perfomance of cultured fish leading to low economic returns. Lake Harvest Farm has experienced problems of water quality, algal blooming and poor quality of effluents released from the *Oreochromis niloticus* culture ponds to surrounding environment. However, the causes for these problems are yet to be determined. Hence, the water quality and plankton of Lake Harvest Farm were monitored in different pond systems of Lake Harvest Farm namely: holding, breeding and fingerling ponds over a period of 12 months (August 2004 to July 2005). The different pond systems at the Farm were managed using different pond management regimes and study ponds (four ponds per each pond system) were randomly selected and sampled at monthly intervals. A site close to the water pump was also monitored to assess the quality of the influent water that was pumped into the study ponds. Ordination and Correlational Analysis, were used to assess relationships between water quality, plankton and pond management variables. This study also provides preliminary information on the diet of *O. niloticus* fingerlings in Lake Harvest fish ponds. Fish stomachs recovered from 240 fingerlings sampled from the Farm were examined and their contents analysed. Frequency of occurrence method was employed in this study.

The water quality of Lake Harvest fish ponds was hyper-trophic and some of the analysed physicochemical parameters were beyond the limits recommended for fish farming. The trophic status of the study fish ponds was related to pond management regimes and temporal fluctuations of temperature. The fingerling ponds were the most nutrient rich and the water quality of the breeding ponds was similar to influent water whilst the water quality of other pond systems was significantly different from that of influent water. The most abundant phytoplankton in the fish ponds was the cyanophyte *Microcystis* which has been implicated in toxic blooms of freshwaters and the highest density was recorded in nutrient rich fingerling ponds. The density of *Microcystis* was sometimes above the threshold of toxicity for cyanophytes especially during the hot months. Weak relationships between zooplankton with either water quality or pond management variables were observed in the fish ponds. The diet of *O. niloticus* fingerlings in the ponds was mainly composed of fish pellets, phytoplankton (mainly *Microcystis*) and there was less occurrence of zooplankton in the fish stomachs. Therefore, in order to improve the water quality of Lake Harvest fish ponds the study suggests that influent water should be drawn away from the effluent disposal point, regular removal of silt from the fish ponds, and reduction of feeding rates particularly in the most nutrient rich fingerling ponds. Feeding rates may be reduced by assessing the viability of integrating available plankton in the fish ponds as natural feed for the cultured fish. The integration of plankton as feed for fish will improve the sustainability of the project by reducing cyanophyte abundance, occurrence of algal blooming and production cost associated with feed inputs.