

Feeding and grazing in Lake George, Uganda

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The fauna of Lake George is dominated by herbivores, in particular the fish *Tilapia nilotica* and *Haplochromis nigripinnis*, and the cyclopoid copepod *Thermocyclops hyalinus*. Digestion, and the assimilation of carbon from algae, by these herbivores were studied in detail. It was found that, contrary to previous observations reported in the literature, both fish and zooplankton were able to digest and assimilate blue-green algae. The diurnal feeding patterns of the herbivores were examined, and methods devised for assessing, in terms of carbon, the daily ingestion of algae. Hence, using biomass data, the total amount grazed by the herbivores was calculated. Estimates of carbon requirements at other trophic levels were made, as was an assessment of the required level of net production by the algae for comparison with figures for standing crop and net algal production measured by other means.

Food selection by secondary and tertiary producers is discussed, and in several species age correlated changes in selectivity were examined. Both the major herbivorous species of fish adopt phytoplankton feeding after a period of carnivorous or omnivorous feeding as fry. *Thermocyclops hyalinus* is herbivorous all its life, but the size of particle taken changes with age. There are more species of carnivorous than herbivorous fish and these exploit a wider variety of food sources; the few species studied also show changes in food preference with age.

INTRODUCTION

The Royal Society–I.B.P. team was established to investigate productivity at all trophic levels in Lake George. Previous workers (Fish 1952, 1955) have concluded that blue-green algae, the dominant elements of the phytoplankton, are not digested by herbivores and therefore do not enter into the food chains. Blue-green algae are known to be ingested by the dominant herbivores in this lake, and thus the question of whether or not these species can digest and assimilate blue-green algae is critical to any interpretation of the relationship between primary and secondary production in the lake.

Digestion and assimilation of algae

The digestion of algae by the herbivorous fish in Lake George was studied by D. J. W. Moriarty (1973). From this investigation it appeared that enzymic digestion occurred in the intestine, but only after acid lysis of the algal cells had already taken place. The lowest pH value recorded in the stomach of *Tilapia nilotica* was 1.4. Experiments *in vitro* indicated, by the degree of subsequent digestion by intestinal enzymes, that lysis was more effective at this pH than at any higher value (figure 1). Very little digestion occurred after algae had been subjected to acid concentrations at or above pH 2.0. Experiments in which ¹⁴C labelled monospecific cultures of algae were fed to fish in the laboratory showed

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