

Diet and food selection of *Barbus aeneus*, *Clarias gariepinus* and *Oncorhynchus mykiss* in a clear man-made lake, South Africa

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Abstract

The diet and food selection of *Barbus aeneus* (Burchell, 1822), *Clarias gariepinus* (Burchell, 1822) and *Oncorhynchus mykiss* (Walbaum, 1792) were investigated in Sterkfontein Dam. Prey organisms were sampled from the stomachs of fish over a one-year period and in the environment over a two-year period. Stomach analyses and the Strauss index of food selection revealed a herbivorous/benthivorous diet for *B. aeneus*, a benthivorous diet for *C. gariepinus* and a planktivorous diet for *O. mykiss*.

Introduction

Most reservoirs in South Africa are turbid, with modal mean Secchi disc transparencies between 0 and 50 cm (Walmsley and Bruwer, 1980). Feeding studies on freshwater fish in South African reservoirs have frequently been carried out in turbid environments (Eccles, 1983; Gaigher and Fourie, 1984; Tomasson et al., 1983). Sustained high suspensoid loads decrease the food availability and feeding efficiency of fish (Kirk and Akhurst, 1984), which in turn could change their feeding pattern.

Sterkfontein Dam is situated on the Vaal River system, a tributary of the Orange River, and has a low turbidity (Dörgeleh, 1986) compared to Verwoerd Dam (Walmsley and Bruwer, 1980) and Le Roux Dam (Allanson et al., 1983) which are part of the Orange River system. Fish species residing in Sterkfontein Dam (Dörgeleh, 1987) are also found in the latter reservoirs (Hamman, 1980; Jackson et al., 1983).

This study investigated the diet and food selection of the indigenous *Barbus aeneus* and *Clarias gariepinus* under clear conditions. The dietary composition of these species was compared with those in Le Roux Dam. The diet and food selection of the introduced alien *Oncorhynchus mykiss*, a piscivore at larger sizes (Marrin and Erman, 1982), was monitored in order to detect whether predation on indigenous fish occurred.

Study area

Sterkfontein Dam (28°23' to 28°35'S and 28°58' to 29°04'E) is situated in the Eastern Orange Free State, close to the rim of the lower Drakensberg escarpment, at an altitude of 1 620 m (Fig. 1). This reservoir with a mean turbidity of ≤ 10 NTU for the largest part of the surface area (about 80%) has a capacity at full supply level of $2\,656 \times 10^6$ m³, a total surface area of 6 940 ha and a maximum depth of 82 m. Sterkfontein Dam runs from north to south and is located on the Nuwejaarspruit, which is a tributary of the Orange-Vaal River system. Construction of the dam wall started in 1969 and was completed in 1985. Regular pumping of water from the Tugela River in Natal via Kilburn Dam and into Sterkfontein Dam began in November 1974.

Methods and materials

Methods

Four permanent sampling localities, based on turbidity and depth (Dörgeleh et al., 1993) were used for sampling fish and zooplankton (Fig. 1). Localities 1 and 2 were in the less turbid area (≤ 10 NTU) and localities 3 and 4 were in the turbid area (>10 NTU). Two localities (1 and 3) were stationed in deep water (≥ 30 m), while Localities 2 and 4 were used to sample fish closer to the shore-line. The constantly changing water level necessitated the shifting of Localities 2 and 4 to stay at depths of 2 to 5 m and about 50 m from the shore.

Gill nets were placed parallel to the shore. Each gill net measured 25 m x 2 m in size with stretched mesh sizes of 35, 50, 65, 73, 85, 100, 120 and 150 mm respectively. These were connected in series with spaces of 2 m between each and were left overnight for 16 h at each locality.

Fish

From March 1984, for a period of 13 months, fish were sampled monthly using gill nets at each of these 4 localities. It is recognised that the length of time which fish spend in gill nets after being caught might affect the fullness of stomachs and therefore the accuracy of the data. Data of stomach contents for each locality and the various months within each season were combined.

The oesophagi and foreguts (anterior third of intestine) of *B. aeneus*, and the oesophagi and stomachs of *C. gariepinus* and *O. mykiss*, were cut out and preserved in 5% formaldehyde. The stomach contents of each fish was filtered through a 100 μ m mesh plankton net and the residue retained. The latter was examined under a stereo microscope. Each prey item was identified at least to order and, if possible, to family or genus and separated into taxonomic groups. Each taxonomic group and the total contents of each stomach were weighed to determine the percentage composition.

The food selection of the 3 fish species for certain prey items was calculated by using the Strauss index of food selection (Strauss, 1979), which is simply the numerator of Ivlev's index:

$$L = \frac{n_i}{\sum p_i}$$

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