

A *Ceratium hirundinella* (O.F. Müller) bloom in Hartbeespoort Dam, South Africa

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Abstract

During the late winter to early spring of 1999 *Ceratium hirundinella* was recorded for the first time in the Hartbeespoort Dam, South Africa, and in bloom forming conditions. The *C. hirundinella* bloom started in July 1999 after complete mixing occurred and a *Microcystis aeruginosa* bloom disappeared. *C. hirundinella* occurred in chlorophyll *a* concentrations up to 4243 mg/l. The clogging of filters at water care works and a fish kill were encountered during the same period, in the area. This paper discusses the extent of the bloom, the possible causes and the water characteristics found in the Hartbeespoort Dam during the development of the bloom.

Introduction

Ceratium hirundinella (O.F. Müller) (Figs. 1a & b) is a common and widespread freshwater dinoflagellate. *C. hirundinella* has been found in numerous man-made impoundments in South Africa (Shillinglaw, 1981; Truter, 1987 & Van Ginkel, 1999), but the species has not been found in previous studies in the Hartbeespoort Dam (NIWR, 1985 & Van Ginkel, 1999). Although *C. hirundinella* has been found to be periodically dominant in many South African impoundments of different trophic status (e.g. Klipvoor Dam, Kosterrivier Dam, Boskop Dam and Bronkhorstspruit Dam) (Van Ginkel, 1999), it has not previously been associated with extreme bloom conditions.

The Hartbeespoort Dam is situated on the confluence of the Crocodile and the Magalies Rivers (Fig. 2), that drain highly populated urban areas, namely Pretoria, Johannesburg and Krugersdorp. The catchment lies in the highveld region of Southern Africa. At full supply level the impoundment lies at 1 162 m a.m.s.l. and covers an area of 20.3 km² and has a volume of 194.8 x 10⁶ m³. This gives an un-weighted mean depth of 9.5 m. Maximum depth at the dam wall is 31.3 m. Residence time in the Hartbeespoort Dam is approximately one year (Hely-Hutchinson and Schuman, 1997). The Hartbeespoort Dam is a recreational Mecca for the Gauteng and North-West regions.

The impoundment has been subject to algal blooms (*M. aeruginosa aeruginosa*) (NIWR, 1985) and massive aquatic weed (*Eichhornia crassipes*) development for over 15 years. The impoundment was classified as a hyper-eutrophic system (NIWR, 1985) and the promulgation of the former 1 mg/l P effluent standard was to be applied in the catchment (DWA, 1988; Anon, 1988a; Anon, 1988b). Because of financial and capacity constraints in the metropolitan areas, sewage treatments works do not always comply with the 1 mg/l P effluent standard. There are also numerous informal settlements in the catchment, as well as intensive farming activities, all of which contribute to the extent of eutrophication of the aquatic system.

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Figure 1

Photographs of *Ceratium hirundinella* found in the Hartbeespoort Dam in October 1999 indicating cyclomorphosis
a) Short horns on the hypotheca, and
b) Long horns on the hypotheca (Photographs by E. Truter)