

Diatoms as indicators of water quality in the Jukskei-Crocodile river system in 1956 and 1957, a re-analysis of diatom count data generated by BJ Chohnoky

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Abstract

South Africa has a long legacy of diatom research. The eminent diatomist Dr BJ Chohnoky spent much of his working life examining and enumerating diatom communities found in Southern Africa. Most if not all of Chohnoky's collected diatom material in the form of mounted material on glass slides accompanied by diatom analysis sheets is stored in the South African Diatom Collection currently housed at the CSIR in Durban. As Chohnoky only employed enumeration methods yielding a margin of error of 2% or less, Chohnoky's results should provide an accurate reflection of the structure of the diatom communities that he examined. It is the aim of the present study to demonstrate the value of these historical diatom analyses for inferring past water quality conditions using the diatom-based index method. Data for the Jukskei-Crocodile River system were obtained from the South African Diatom Collection for the period 1956/1957. The nomenclature of the diatoms listed on Chohnoky's data sheets was modernised and the data then entered into OMNIDIA v3.1. Diatom index scores generated from OMNIDIA v3.1 were in general in agreement with Chohnoky's own assessment of water quality (especially with reference to organic pollution). It is concluded that the diatom analysis records housed in the South African Diatom Collection constitute a valuable resource for the assessment of past conditions of rivers and streams.

Keywords: BJ Chohnoky, historical diatom analyses, diatom indices, historical water quality

Introduction

Over many years the work of Dr BJ Chohnoky provided an invaluable contribution to the knowledge of the taxonomy and ecology of diatom species he encountered in a variety of southern African habitats. Chohnoky's ecological work attempted to provide a reflection of water quality based on the specific pollution tolerances of diatom species, and especially to nitrogenous compounds. In addition Chohnoky was one of the first people to predict pH of a water-body based on its diatom community (Chohnoky, 1958). Chohnoky was only able to relate several key species from a particular diatom community to different pollutants; later workers have had the luxury of using statistical techniques such as correspondence analysis (Ter Braak and Prentice, 1988) to determine the relationships between the abundances of all diatom species encountered in a certain community and the chemical composition of their aquatic environment. Consequently inferred tolerances can be assigned to diatom species for a whole range of water quality variables rather than just for nitrogen or pH.

When Chohnoky's (1968) definitive work on the diatoms *Die Ökologie Der Diatomeen in Binnengewässern* is examined it is noted that Chohnoky painstakingly dealt with all practical aspects relevant to diatom ecological studies. He first stressed that any person studying ecology should have a sound taxonomical

background; secondly he carefully determined margins of error for diatom analysis. Most importantly he tested various counting procedures and determined whether different slides from the same site need to be counted to generate an accurate result, how many individual cells should be counted and the manner in which diatom cells should be counted. Chohnoky only employed methods yielding a margin of error of 2% or less. Thus, Chohnoky's diatom analysis sheets should provide an accurate reflection of the structure of the diatom communities that he encountered. If Chohnoky's diatom community analysis is considered to be accurate then the ecological conclusions drawn from his data should be equally sound.

An explanatory note follows about working with diatom species encountered in South Africa: When diatom publications were written by various authors (Chohnoky, Giffen, Schoeman and Archibald) it was with the intention either to describe all diatom species encountered in a given sample (i.e. community structure), or to describe novel species from a particular locality. The method of illustrating these publications was with line drawings, which are both time-consuming and difficult to generate. Thus common species were usually not illustrated and the reader is most often referred to the works of Hustedt or other authors for illustrations of the species in question. Thus we have a large amount of South African literature that has few, or no, illustrations of commonly encountered diatom species, only novel and rare species. In the late 1980s workers such as Schoeman and Archibald used photographic images to illustrate articles, such as the work done in Namibia at the Gross Barmen Thermal Springs (Schoeman and Archibald, 1988). In this work common species with their variations are illustrated using photomicrograph images.

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