

A semi-quantitative survey of macroinvertebrates at selected sites to evaluate the ecosystem health of the Olifants River

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ABSTRACT

This study was conducted to evaluate the ecosystem health of the Olifants River by means of semi-quantitative surveys of the macroinvertebrates at 7 selected sites in the catchment. These surveys were performed during the high- and low-flow seasons for 2 consecutive years. Macroinvertebrates were collected by using a net consisting of a 30 cm square steel frame with a sturdy handle, to which a Perlon gauze net with a mesh of 1 mm was attached. Semi-quantitative surveys were done by sampling the vegetation, as well as the substratum, with the net at each site for approximately 15 min. The pH, water temperature and conductivity were measured in situ at each site during the different surveys. Samples were fixed and preserved in 90% ethanol and thereafter sorted, identified up to family level and counted. The specimens were categorised as tolerant, moderately sensitive or highly sensitive, according to the guidelines set by the South African Scoring System Version 5 (SASS5). Although a total of 95 taxa were recovered during this study, only 7 of these taxa were categorised as highly sensitive, it can be concluded that the water of the Olifants River is in a poor state of health as revealed by the macroinvertebrate assemblages.

Keywords: Olifants River, macroinvertebrates, river health

INTRODUCTION

The Olifants River Catchment is subjected to extreme demand for natural resources and associated land modification and pollution (Ballance et al., 2001). Van Vuuren (2009) quotes the view of aquatic ecologist Dr Peter Ashton that, next to the Vaal River, the Olifants River is probably the hardest working river in South Africa, having been used and abused for over 5 decades, and that pollution is progressively worsening. Rashleigh et al. (2009) also concluded that the water quality of the Olifants River is not in a desirable state. Although this river is often described as one of the most polluted rivers in Southern Africa (Batchelor, 1992; Engelbrecht, 1992; De Villiers and Mkwelo, 2009; Heath et al., 2010; CSIR, 2012) the quality of ecological units varies from moderate to poor (Ballance et al., 2001). Ecological systems which were deemed to be moderately impacted in a 2001 study include the Tongwane, upper reaches of the Mhlapitse and the major part of the Blyde River, where natural conditions are maintained, as well as the lower reaches which are protected by conservation activities (Ballance et al., 2001). In the upper part of the Olifants catchment mining activities are one of the main contributors to the negative impacts on river health (Ballance et al., 2001; O'Keeffe and Le Quesne, 2009). This area is characterised by extensive invasion of alien vegetation and to a lesser extent alien fauna (Ballance et al., 2001). The releases of water and sediment from impoundments without sufficient regard for ecological impacts are the major causes of downstream environmental degradation (Ballance et al., 2001). These phenomena are

especially relevant with regard to the middle and lower parts of the Olifants River catchment (Ballance et al., 2001). Our own observations during surveys in 1995 (De Kock and Wolmarans, 1998), 2001 (De Kock et al., 2002) and 2006 (Wolmarans and De Kock, 2006) to investigate the diversity of freshwater molluscs in water bodies, including the Olifants River, in the Kruger National Park (KNP), also pointed to a decrease in species diversity and number of specimens per species.

The controversy around the health of this river most likely results from a lack of detailed data pertaining to the macroinvertebrate diversity of this river. Macroinvertebrates are well known to have different sensitivities to pollution and habitat transformation and are therefore very useful indicators of pollution. Different taxa of macroinvertebrates also exhibit differing tolerances to individual water quality variables (Dallas and Day, 1993), therefore water of suitable quality is essential to maintain healthy populations of aquatic organisms (Malan and Day, 2003). For the classification of sensitivity the SASS5 sensitivity scores for individual taxa can be used (Dickens and Graham, 2002). Due to the fact that macroinvertebrate assemblages are often used to determine biotic integrity or ecological health of river ecosystems (Oberholster et al., 2005; Masese et al., 2009; Malherbe et al., 2010; Arimoro et al., 2011), it was decided to do a semi-quantitative survey to provide an indication of water quality and ecosystem health at various preselected sampling sites in the river, spread over several of its tributaries.

MATERIALS AND METHODS

Sampling equipment and techniques

Two surveys of aquatic macroinvertebrates were conducted during both high and low flow periods for 2 successive years at 7 preselected sites.

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