



Dispersal and population-level mortality of *Micropterus salmoides* associated with catch and release tournament angling in a South African reservoir



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ABSTRACT

This study assessed the impact of catch and release tournament angling on a largemouth bass (*Micropterus salmoides*) population in Wriggleswade Dam, a 1000 ha reservoir in South Africa. Effort was estimated at 648 boat days/year and catch as 2236 fish/year based on tournament catch data (2005–2012). Initial mortality rate (dead fish at the tournament weigh in) averaged 0.53%/yr. Dispersal was estimated from the recapture locations of 124 of 786 fish tagged and released during tournaments. The distance of the recapture locality from the release site (dispersal distance) was positively correlated with time at liberty for the first 50 days following release, after which recapture localities were random (average 4 km from the release site). At a population level, the instantaneous rate of total mortality ($Z = 0.36\text{--}0.50\text{ yr}^{-1}$) was lower than in many other fisheries indicating a negligible impact of catch and release tournament angling at the effort levels experienced by this fishery.

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1. Introduction

The potential of recreational anglers to negatively affect fish stock size (Cooke and Cowx, 2004) has resulted in the practice of catch and release angling as a mitigation measure (Cooke and Cowx, 2006). Angling tournaments are an increasingly popular recreational activity (Wilde, 2003; Driscoll et al., 2007, 2012; Schramm and Hunt, 2007) that impose additional stressors on fish populations through their potential for increased removal of fish in localised areas and the continual selection for larger fish by anglers, which may influence population dynamics and ultimately alter the genetic stock structure (Meals and Miranda, 1994; Quinn, 1996; Wilde, 1998, 2003; Cooke et al., 2000; Wilde and Paulson, 2003). As a result, live fish weigh in and release has long been mandatory in some tournament fisheries, particularly those focussing on

black bass (*Micropterus*) species (Clark, 1983; Schramm et al., 1991; Quinn, 1996).

Micropterus species are native to North America, however, due to their popularity as sport fishes (Robbins and MacCrimmon, 1974; Jackson, 2002; Quinn and Paukert, 2009) they have been introduced into many ecosystems across the globe (Welcomme, 1992). Specialised recreational fisheries developed following their introduction, and black bass tournaments are now a popular recreational activity not only in North America (Schramm et al., 1991; Schramm and Hunt, 2007; Driscoll et al., 2012) but also in many other countries. For example, the 2013 black bass fishing world championships were held in Spain, and competing teams represented Russia, Croatia, Germany, France, Spain, Italy, Portugal, Mexico, Venezuela, Swaziland and South Africa (FIPSeD, 2013).

Catch and release, a typical tournament policy in the USA since the 1970s (Clark, 1983; Schramm et al., 1991; Quinn, 1996), is also common practise in black bass tournaments around the world. Competitors keep fish alive because anglers bringing in dead fish are penalised. In addition, tournaments usually implement a five-fish limit, and anglers can replace smaller fish with larger fish throughout the day to attain the largest five-fish aggregate weight.

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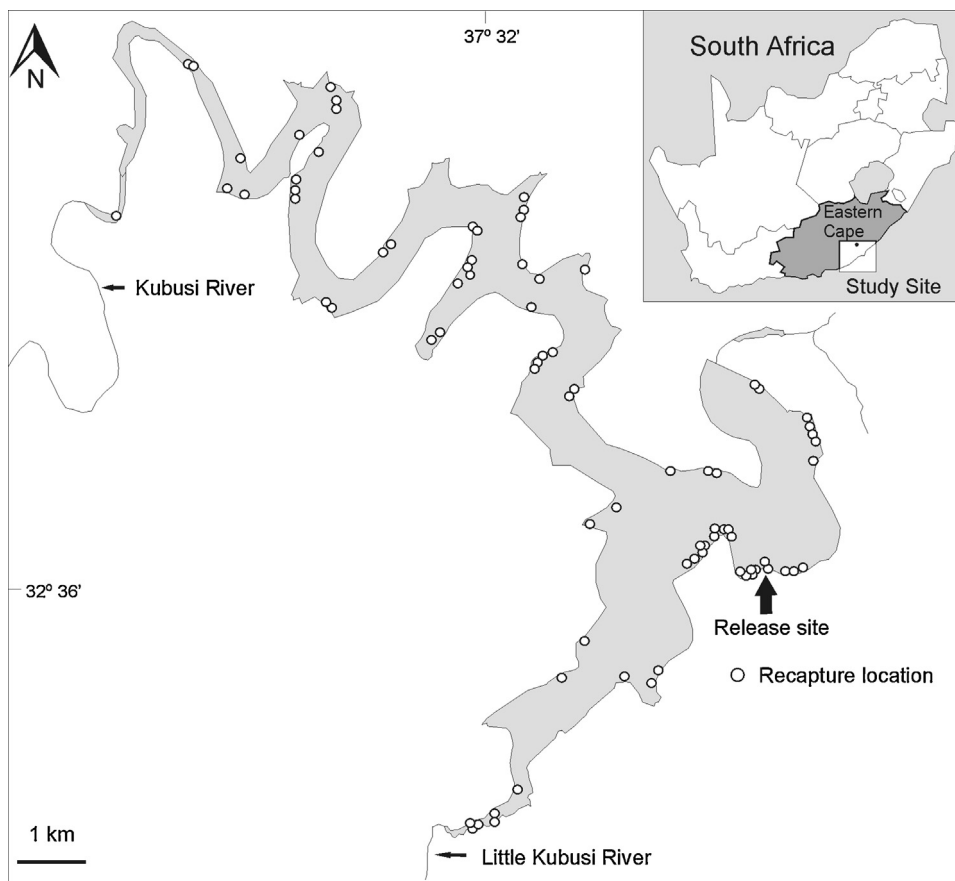


Fig. 1. The study site, Wriggleswade Dam in the Eastern Cape Province, South Africa. The release site for all tournament weighed fish and the recapture location of 124 tagged largemouth bass *Micropterus salmoides* are indicated.

At the tournament weigh in, fish are weighed on certified scales prior to being released, often at a common release site.

While catch and release has decreased tournament-associated mortality, high tournament mortality could reduce fishing quality, and thus, there is a need to evaluate whether tournaments can increase mortality over levels expected for black bass populations. Previous meta analyses have reviewed tournament mortality (i.e. the percent of released fish that die after weigh in, [Wilde, 1998, 2003](#)), but few studies have quantified whether tournaments represent a significant source of fishing mortality and thus influence overall total mortality rates. [Kerns et al. \(2012\)](#) noted that catch and release studies should attempt to quantify population-level impacts through overall annual mortality rates, rather than estimates of the percent mortality of released fish.

Post-release behaviour of *Micropterus* species and particularly *Micropterus salmoides* (Lacépède), has received considerable research attention. Telemetry studies indicate that dispersal following relocation can be slow, with some fish taking three months to disperse 2 km from a release site in Lake Martin, USA ([Hunter and Maceina, 2008](#)), while in Lake Mead, USA, the fish had not moved further than 3.5 km from their release site 43 days after displacement ([Wilde and Paulson, 2003](#)). In contrast, an acoustic telemetry experiment simulating tournament displacement of 10 fish in Wriggleswade Dam, South Africa, demonstrated that largemouth bass relocated over a distance of 4.3 km and dispersed rapidly following release ([Huchzermeyer et al., 2013](#)). Therefore, Wriggleswade Dam was an interesting case study to investigate post-release dispersal of *M. salmoides*. The aim of this study was to investigate the potential impact of tournament angling on a *M. salmoides* population in this 1000 ha reservoir where tournament

angling is the predominant use. Tournament catch data and an angler-assisted tag-recapture study were used to describe the fishery and test the hypotheses that: (1) released fish would disperse rapidly throughout the reservoir following release, and (2) the total mortality rate of the *M. salmoides* population in the reservoir would be lower than for populations where fish are commonly harvested.

2. Materials and methods

2.1. Study site and description of tournament angling

This study was conducted in Wriggleswade Dam (32°35'35"S; 27°33'07"E; 708 m ASL), a 1000 ha water storage reservoir of the Kubusi River, South Africa ([Fig. 1](#)). The climate of the area is moderately temperate, with mean monthly air temperature ranging from 13.2 °C in July (austral winter) to 20.9 °C in February (austral summer) ([SAWS, 2012](#)). Wriggleswade Dam is a popular recreational angling and bass tournament venue ([Huchzermeyer et al., 2013](#)) surrounded by privately owned shoreline, resulting in limited subsistence fishing.

Tournaments on Wriggleswade Dam are organised by angling clubs that are affiliated to the South African Bass Anglers Association (SABAA). SABAA is affiliated to the Bass Anglers Sportsman Society (BASS) in the USA and tournament rules are standardised. Competitors always fish from a boat, and tournaments are either individual (one angler per boat) or team events (two anglers per boat). Irrespective of the number of anglers on a boat, the tournament daily bag limit is five fish per boat per day. An exception is a "big-fish" tournament held in March each year, where the daily

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