

FISH COMMUNITIES IN THE WITTE RIVER, SW CAPE AND SOME FACTORS WHICH MAY REGULATE SPECIES DISTRIBUTION

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Introduction

The "upper" Witte River is well known to Cape trout anglers. In majestic scenery, fortunate anglers have since the turn of the century caught beautifully marked brown trout (*Salmo trutta*). But what of the fishes inhabiting the rest of the river? Information on fish distribution throughout the river is essential for effective conservation management and to regulate future development in its catchment. This paper presents an overview of the river and its historical and present fish community and discusses some factors which may regulate the unusual distribution of fish species currently present in the Witte River.

Study site

The Witte River is situated in the SW Cape and flows through the majestic Bainskloof pass that links Wellington by road to Tulbagh, Ceres and Worcester. The river is only 18km in length from its source in the Hawequas Mountain Catchment Area to where it joins the upper Breede River. The geology of the catchment area is mainly Table Mountain Sandstone and covering vegetation consists mostly of mountain fynbos. These characteristics and the high winter rainfall in the catchment have culminated in a perennial river with clear, unstained waters that are acidic and nutrient poor. Invasive stands of black wattle (*Acacia mearnsii*) have become a major problem in the lower section of the river and in areas have replaced the indigenous riparian vegetation. This alien species from Australia has several adverse impacts on our local rivers including destabilising river banks and reducing stream flow in summer due to high rates of water usage by adult trees.

The Witte River is a second order river, dominated by a boulder and bedrock substrate which has three zones, a very short headwater zone from its source for a few hundred meters, followed by a mountain stream zone to just above Tweede Tol, and finally a foothill zone to its junction with the Breede River (Brown & Tharme 1994, Brown pers. comm.). A marked feature of the river is the sharp drop in elevation from the headwater zone at approximately 900m altitude to its junction with the Breede River at approximately 200m altitude.

Historical fish records

Data records indicate that prior to the introduction of alien fishes, the Witte River system contained Burchells redfin minnow (*Pseudobarbus burchelli*), Cape galaxias (*Galaxias zebratus*), Cape kurper (*Sandelia capensis*) and whitefish (*Barbus andrewi*). The "upper" river was apparently fishless (Harrison 1933, in Yates 1960) while Burchells redfin minnow, Cape galaxias and Cape kurper would have occurred lower down in the river. Harrison (1952) recorded whitefish from the "lower" Witte River.

Brown trout were introduced into the river in the 1890's (Harrison 1975) and reproduced so successfully that the CPS decided in 1935 that it was unnecessary to continue stocking the river with this species. Rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) were introduced later into the river but failed to establish themselves (Yates 1960). Conditions were probably more favourable for the already established brown trout which then outcompeted the other two species. It is likely that a combination of summer heat waves and low flows may have prevented the establishment of any trout species below Eerste Tol. Smallmouth bass (*Micropterus dolomieu*) were introduced into the Breede River system in 1939 and 1940 (Harrison 1953) and soon established reproducing populations. The species then invaded all suitable reaches of the system, including the lower Witte River, where the lower flow velocities and deeper pools, typical of foothill rivers, provided reasonable habitat.

Present distributions

The authors completed a fish survey of the Witte River in March 1997. This survey allowed the authors to divide the river into three sections based on fish distribution patterns. Pools and deep riffles were snorkelled to determine composition of the fish community and estimate species abundances (Table 1). Surface water temperatures recorded on 13 March 1997 are also shown in Table 1.

The Witte River is shown to have an unusual distribution of fish species, culminating in three distinct ichthyofaunal sections, each dominated by a distinct fish community. Possible reasons for the distinct communities are discussed below.

Factors which may affect fish community composition

The authors have not done detailed qualitative studies to verify the following arguments. As such they are speculative and should be investigated further.

Table 1: Distribution of fishes and water temperature variation in three sections of the Witte River

RIVER SECTION	SPECIES RECORDED	ABUNDANCE	WATER TEMP (DEGREES C) ON 13 MARCH 1997
Upper (source to about 1 km above Eerste Tol)	Brown trout	3 pools snorkelled near "Palmiet pool", 2 fish seen (15 cm - 20 cm)	14.5
Middle (1 km above Eerste Tol to about 0.3 km above Tweede Tol)	Burchells redfin minnow and cape kurper	Redfins more common than Cape kurpers in pools	19
Lower (0.3 km above Tweede Tol to junction with Breede River)	Smallmouth bass and very small Burchells redfin minnow	Bass common in all pools but most fish under 20cm with juvenile redfins present in backwaters	21.5

Elevation and gradient (physical barriers) and predation by alien fishes (a biological barrier) are regarded as the main factors regulating fish distribution in the Witte River.

Elevation affects water temperature with the upper Witte being considerably colder than the lower sections. Elevation combined with gradient effects flow velocities and river structure. The mountain stream zone of the Witte is a high gradient river and has typical physical barriers to upstream fish migration such as waterfalls, cascades and high flow velocities.

The alien smallmouth bass is a voracious piscivore that has been shown to eliminate small indigenous fish, especially redfin minnows and juveniles of the larger species (eg whitefish and clanwilliam yellowfish) where it occurs. Brown trout are known to be more piscivorous than rainbow trout and will readily consume "baitfish" if these are locally abundant.

We argue that the upper Witte is dominated by the alien brown trout because its high altitude temperate waters (average altitude is about 700m), varied habitat and good flow provide for excellent habitat. Historical records indicate that indigenous fish did not occur in this section. This may be due to a combination of unsuitably low summer temperatures (especially for the Burchells redfin and Cape kurper) and waterfall barriers upstream of their upper distribution limits. The hardy and widespread Cape galaxias may be present in this section of the river.

In contrast, the less elevated and hence warmer, middle Witte is dominated by an indigenous fish community comprising Burchells redfin, Cape kurper and probably Cape galaxias.

Brown trout are not resident in this section, probably because summer water temperatures exceed their upper tolerance limits when flows are low and heat waves occur. They may show seasonal downstream migrations into this section from autumn to spring when water temperatures are below 20 deg C. Anglers can confirm this. Smallmouth bass do not occur in this section because a physical barrier (a rock sill approximately 2m high) in the river bed about 300m upstream of Tweede Tol prevents their upstream migration from the lower Witte.

The warm and less turbulent lower Witte River is dominated by the alien smallmouth bass. In the nutrient poor waters of the Witte, few fish exceed 30 cm (the average fish is between 15 to 20 cm). This population of smallmouth bass hence has little if any recreational value. Their presence has come at a great conservation cost. Historical populations of Cape kurper and whitefish have been eliminated by the predatory impacts of this introduced species.

Very small juveniles (1-2 cm) of Burchells redbfin were found sheltering in the backwaters and below palmiet beds of the lower Witte but no subadults or adults were seen. We believe these had been washed downstream from the middle Witte and were not immediately eliminated by the bass because of their small size. However, as soon as juveniles reached a size where they readily visible to bass (ie 3-4 cm) they were quickly eliminated in the clear waters.

Management implications

The findings of this small study have several important management implications for this river:

1. The brown trout population in this river is not regarded as a conservation problem from an indigenous fish perspective. However, it would be valuable to investigate their impact on the aquatic invertebrate community. The presence of this species does not detract from the conservation value of the upper Witte which can be described as a wild and scenic river. Existing utilisation of water from this section of the river by the Paarl/Wellington municipality will need to be reviewed once the new Water Act is legislated. This Act is expected to make provision for an environmental reserve (ie water for the environment and basic human needs) which enjoys priority over all other uses.
2. The middle Witte with its healthy community of indigenous fishes and relatively pristine catchment has a very high conservation value. No stocking of any alien species should be allowed in this section of the river. Any development proposal which would negatively impact on this section and its biota would require a full impact assessment by CNC.
3. The lower Witte is regarded as a marginal area for smallmouth bass and its fishery is probably of negligible importance to the bass angling fraternity. This area of the river is an ideal candidate for rehabilitation if invasive alien trees and smallmouth bass can be removed and prevented from re-entering from downstream sources. To accomplish this an artificial barrier will need to be constructed in the lower Witte which prevents bass from crossing it. Bass could then be selectively removed upstream of the barrier until they are completely eliminated. Juvenile whitefish could then be introduced from a suitable population and downstream colonisation by Burchells redbfin and Cape kurper should occur once the alien predators have been removed. The whitefish could be the basis of an indigenous sportfishery.

The support of the bass fishing fraternity, CNC, CPS, the Department of Water Affairs and Forestry and local landowners would be needed to accomplish this task.

Finally, the authors would like to encourage readers of *Piscator* who enjoy snorkelling to take a swim in the middle Witte next to Eerste Tol this coming summer. Besides the pleasant water temperature and clear visibility, snorkellers can experience first hand the pleasure of seeing an indigenous fish community in its natural habitat for the first time. Its worth it!

References

- Brown, C.A. & Tharme, R.E. 1994. *Upper Wit River, south-western Cape: Situation assessment of the riverine ecosystem*. Freshwater Research Unit, Department of Zoology, University of Cape Town.
- Harrison, A.C.H. 1952. *The Cape witvis (Barbus andrewi)*. *Piscator* 21: 25-27.
- Harrison, A.C.H. 1953. *The acclimatisation of smallmouth bass*. *Piscator* 27: 89-96.
- Yates, A. 1959. *The Witte River, Bains Kloof*. *Piscator* 47: 120-129.