

**AN ASSESSMENT OF SELECTED BIOLOGY ASPECTS OF THE TWO YELLOWFISH SPECIES
LABEOBARBUS KIMBERLEYENSIS AND *L. AENEUS* FROM THE ORANGE-VAAL RIVER
SYSTEM, SOUTH AFRICA.**

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INTRODUCTION

Yellowfish (*Labeobarbus spp.*) are amongst the most widely distributed and most easily related to of our indigenous fishes in South Africa. They are also actively targeted and utilised by various angling and subsistence fishing communities throughout the country, and used as indicator species by resource managers. As a result Yellowfish have a high ecological, economical and social value to South Africans. Although valuable, very little is known about these charismatic species, and unfortunately, before we have the chance to fully understand some of the biological attributes of these species we are losing them. Along with most of our aquatic biodiversity, Yellowfish are being adversely affected by the excessive, unsustainable, anthropogenic use of our aquatic ecosystems in this water stressed country. Specifically, from a Yellowfish population management perspective, for example, some populations of Yellowfish in South Africa have recently been devastated due to poor aquatic ecosystem management practices. On at least one occasion in South Africa a known isolated population of the Bushveld Smallscale Yellowfish (Letaba River system) has been driven into extinction. In other instances, from habitat destruction in the Olifants-Dooring system affecting the Clainwilliam Yellowfish population, to effluent spills across the highveld into the Crocodile and Vaal

rivers or into the Elands River in Mpumalanga which affects the Orange-Vaal Large and Smallmouth Yellowfishes, the Bushveld Smallscale Yellowfish and the Lowveld Largescale Yellowfish, almost all Yellowfish species are being negatively impacted on in some form. These pressures have driven at least two of the six species of Yellowfish occurring in South Africa onto the IUCN Red Data List.

The Vaal River is one of South Africa's most highly utilised, "working rivers" and contains one of the two major distributions (excluding the Orange River) of the Orange-Vaal Large and Smallmouth Yellowfishes. The Vaal River is one of the South Africa's largest and most important river systems in South Africa. This system has been modified to provide most of Gauteng with water which originates from many sources including the Lesotho Highlands Water Interbasin Transfer Schemes (one of the largest and most costly water transfer schemes ever undertaken), and assimilates waste from this highly developed urban area which stands as South Africa's most important economic region. Both of these species are good indicator species which are used to provide the Orange-Vaal River ecosystem managers with vital information relating to the state of and trends of biological community stability in the systems. They are sensitive to water pollution, habitat destruction and harvesting pressure and populations readily respond when these impacts occur in excess on these systems. But again, only a very limited amount of information is available which pertains specifically to the biological attributes of these species, and this limits the potential use, and as a result, value of these species in ecosystem management.

The study has been established to generate a better understanding of the biology and behaviour of these two species of Yellowfish in the Vaal River, in order to develop the ecological, social and economic value of these species. Furthermore this study will attempt to characterise some vital biological aspects of these species to facilitate the direct management and conservation of these important species. Specifically, this study aims to describe the habitat selection/preferences and daily habitual behaviour of 24 Yellowfish (12 Orange-Vaal Largemouth and 12 Orange-Vaal Smallmouth Yellowfish) over an 18 month period on a reach of the Vaal River using radio telemetry tracking techniques. Some additional river ecosystem health assessments will be undertaken during the study which are all aimed to facilitate this research. These assessments include: The assessment of the ecological state of the reach of the Vaal River being

studied, a characterisation of selected environmental variables (habitats, water quality variable changes for example) of the reach being assessed and an assessment of the seasonal changes of the invertebrate communities in this reach.

This study is being undertaken primarily by specialists from Econ@uj (Zoology Department of the University of Johannesburg) and by skilled and unskilled specialists from the Orange-Vaal River Yellowfish Conservation and Management Association. Finally this study is being supported by specialists from the department of Ichthyology and Fisheries Science, Rhodes University and by specialists from the Fresh Water Research Unit of the University of Cape Town.

STUDY SITE

The study is being carried out on a section of the Middle Vaal River downstream of the Orkney weir, upstream of the Bloemhof dam. The 10km or so reach selected for this study is a reach owned by members of the Orange-Vaal Yellowfish Conservation and Management Association. This reach is controlled by the owners and for the duration of this study will generally be closed to other water use related activities to allow the tagged fish to adopt as close to natural behavioural patterns as possible. In addition, this reach is widely considered to contain some of the best Orange-Vaal Largemouth Yellowfish habitat in the Middle Vaal River and has numerous access points onto the river and has a footpath which runs parallel to the river for most of the reach assessed.

METHODS AND MATERIAL

The methodology implemented in this study is based on related methodologies which have been used to successfully track and study Tigerfish (*Hydrocynus vittatus*) and selected Cichlid species in the Inkomati River and the Zambezi system respectively.

Some specific specifications of the study which are being adhered to include the following:

- The life span of an individual tag is approximately 175 days. This results in researchers having to continually tag and release new individuals approximately every five months.

- Only a limited number of fish can affectively be studied at any given time. This additional limitation requires that researches only have approximately between six to eight fish in water at any given time.
- Based on the nature of the study only mature fish are being tagged and studied. As such no Orange-Vaal Smallmouth smaller than 30cm are being tagged and no Orange-Vaal Largemouth smaller than 40cm are being tagged. In addition should a fish lighter than 1.5kg be caught it will not be used as individuals lighter than 1.5kgs are considered to be too small to bear the weight of the tag (+/-10g).
- During the study an assessment of the state of the system is being undertaken on a seasonal basis. Accredited River Health Programme methodologies are being carried out to determine and monitor the ecological state of this reach of the system.
- During the study a complementary assessment of the changes in the environmental variables is being carried out on a continual basis. These variables which include water physico-chemical variables, flow and physical biotope changes, day/night cycles, moon cycles and atmospheric conditions, which are all being monitored as frequently as possible.
- Finally a low confidence seasonal succession assessment of aquatic macro-invertebrate communities is being undertaken in relation to a feeding biology assessment of these Yellowfishes. This assessment has been included to generate some information which relates to the feeding biology of the species.

Tagging procedure:

- Yellowfish will be caught using standard fly fishing angling techniques. An angling technique is preferential to netting the fish as the netting process potentially damages the fish and results in secondary infections. There is as a result a high risk that the fish will not survive and the expensive tags will be lost.
- Before tagging, the fish will be anesthetized using 2-phenoxyethanol (0.2ml per liter water). This is a standard fish anesthetic used at several fish hatcheries in South Africa. The water in the transport container will be aerated using oxygen.
- The telemetry tag will be surgically attached to the fish following standard attachment techniques.

- The fish will receive an antibiotic injection to treat any secondary infections (prophylactic). RANZOL RANBAXY (SA) (Pty) Ltd. 500mg will be administered.
- The tracking device is then tested, the fish is revived sufficiently and the fish is subsequently released.

Data and tracking technology/equipment used in this study:

- A Global Positioning System (GPS) is being used to reference fish localities during the capturing and subsequent tracking surveys.
- An Advanced Telemetry Systems (ATS) receiver Model R210, Frequency: 142-143.999 MHz is being used to track the tagged fish. With this receiver an Element Yagi Antenna and specifically ATS F2030 Tags with a pulse rate of 35ppm, pulse width: 15ms is being used.

The tracking methods involved the routine determination of the location of the tagged fish from a small inflatable boat to an accuracy of about 10m is being carried out. The location of the fish and general habitat variables of the position are being recorded during the tracking period.

INITIAL FINDINGS:

Seven Orange-Vaal Smallmouth Yellowfish and three Orange-Vaal Largemouth Yellowfish have been tagged and tracked to date. The fish were not all tagged at the same time and as such the amount of data collected for each individual varies. The following section describes the results obtained from the tracking survey carried out on one Smallmouth Yellowfish and one Largemouth Yellowfish.

Figure 1 illustrates the capture point (#1) and movement information of the Orange-Vaal Smallmouth Yellowfish, tag no. 322 (Emmeline Pankhurst). The movement is general and the specifics of each habitat will be given at a later stage when more information is collected.

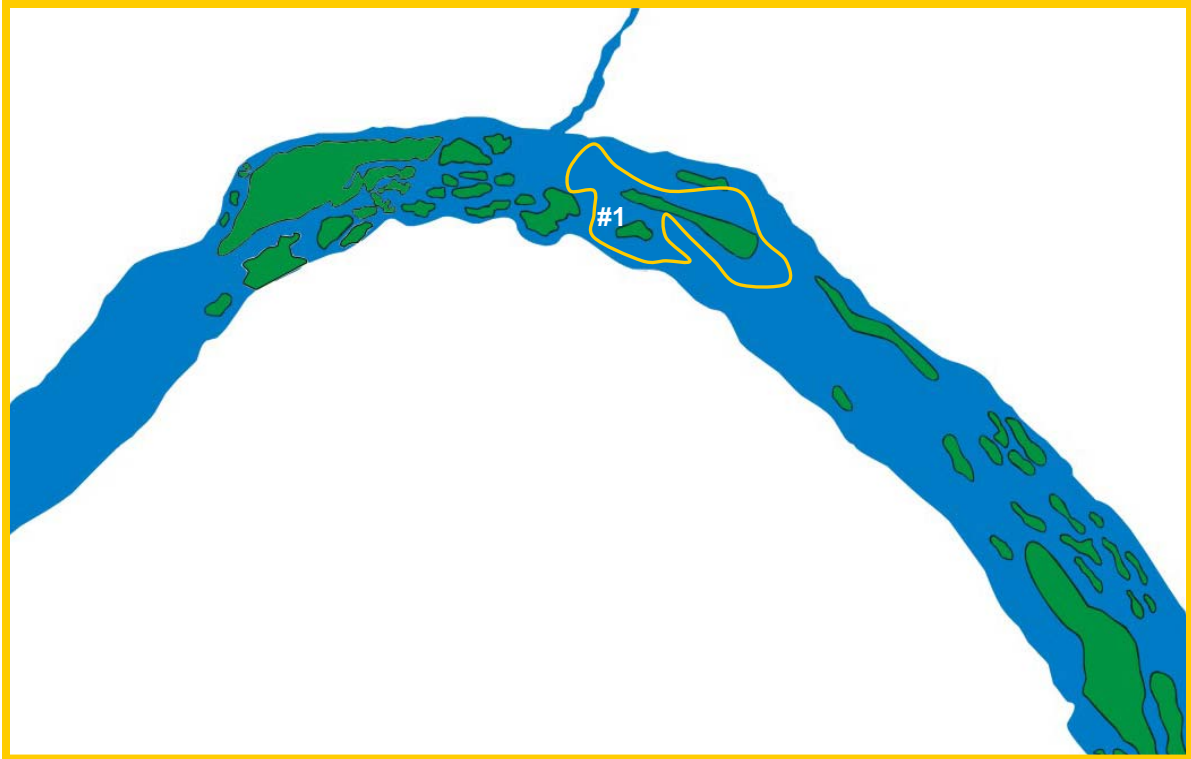


Figure 1. This illustrates a section of the Vaal River with the Maaitjies spruit entering from the North West Province side and the Farm Koedoesdraai on the Free State province side. The figure indicates movement of an Orange-Vaal Smallmouth Yellowfish tag no. 322(Emmeline Pankhurst).

Collection information includes:

- Date captured: 09/08/2006
- Time caught: 16:30
- Captured by: Andre Hoffman
- Captured on: Atomic worm #16
- Fish information: Sex: Female
Total length: 66 cm
Girth: 35 cm
- Habitat information: Local habitat represented by a pool with smooth turbulent water of about 1m deep. Individual captured in the pool close to the edge of the pool in shallow water of about 0.5 m deep.

The fish was not located in the first two weeks because the tracking equipment used requires direct line of site. Tracking was initially done from the river bank on foot. An

area of 10 km was searched, after two weeks a boat was used to search behind the island etc, and during one of these surveys fish no 322 was found behind an island.

After this tracking was done from the boat as much as possible and fish no. 322 was generally observed in a deep pool with dense overhanging marginal vegetation on the sides of the island. The fish was frequently observed moving up and down the side of the island underneath the overhanging vegetation. The fish was mostly observed in this area and found to spend most of its time under overhanging marginal vegetation on the river bank or in close proximity to the bank of an island. It did not move out of the area of approximately 100m during the six month tracking period. The time of day spent tracking the fish varied from day to day in order to generate an understanding of the daily habitual patterns of the individual.

Figure 2 illustrates the capture point (#1) and movement information of the Orange-Vaal Largemouth Yellowfish, tag no. 036 (Ou Hardy). This is just a general movement and more details will be given at a later stage when more information has been collected.

Collection information includes:

- Date captured: 09/11/2006
- Time caught: 15:30
- Captured by: Johan Hardy
- Captured on: Electro Shocking
- Fish information: Sex: Female
Total length: 72 cm
Fork length: 67
Girth: 38 cm
- Habitat information: Local habitat represented by a pool with smooth turbulent water of about 2m deep.

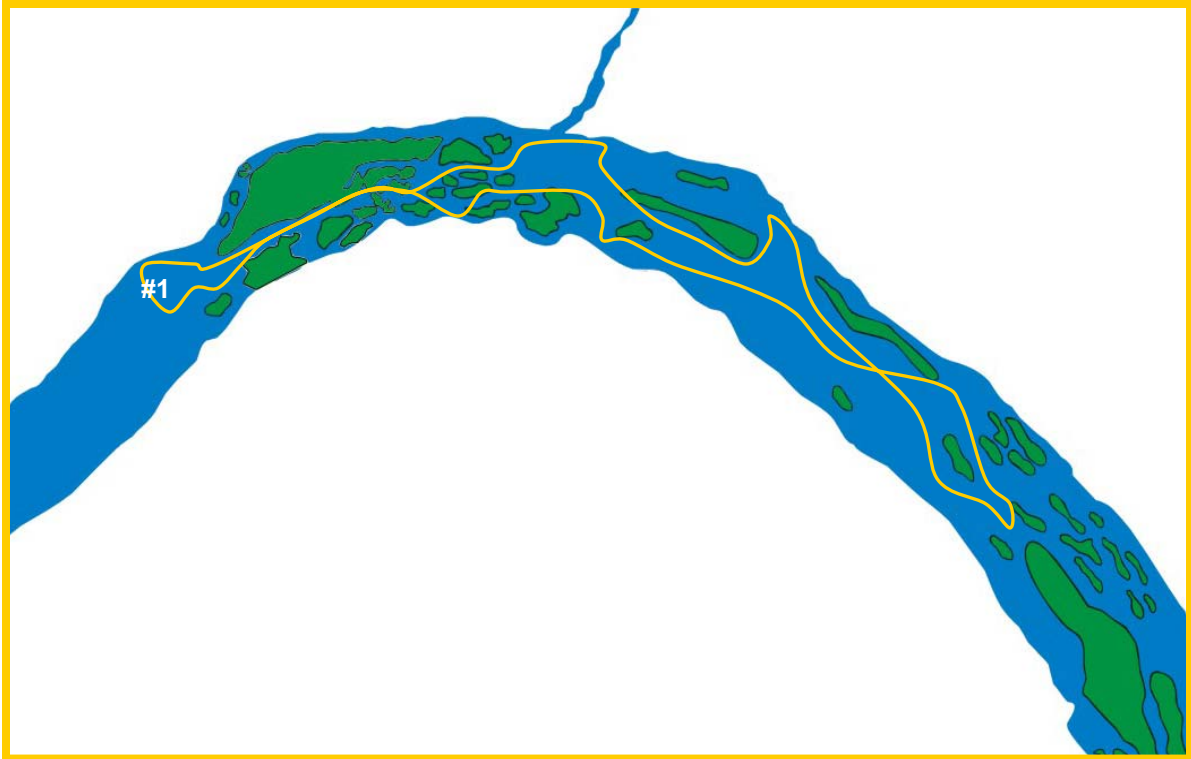


Figure 2. This illustrates a section of the Vaal River with the Maaitjies spruit entering from the North West Province side and the Farm Koedoesdraai on the Free State province side. This figure indicates the movement of a Largemouth Yellowfish tag no. 036 (Ou Hardy).

The Orange-Vaal Largemouth Yellowfish was tracked immediately after it was tagged and returned to the same location in which it was caught. This is a pool area about 1.5m deep with a fast rapid entering it from upstream and shallow areas surrounding the pool. It remained in this area for a few days after which it started migrating out of this area. The behaviour of this individual was observed to be unlike that of the Orange-Vaal Smallmouth which would remain relatively stationary during the day, this individual would move continuously during the period. Tracking with the boat became a problem since it was never known where to launch the boat to track all the tagged fish. After battling to find some of the Orange-Vaal Largemouths for up to two weeks after they were tagged pattern started forming and tracking were improved. All of the Orange-Vaal Largemouth Yellowfish moved noticeably more than the Orange-Vaal Smallmouth and would be in a certain area upstream in the morning and when returning to the same spot the afternoon it would have moved. The Orange-Vaal Largemouth was also found in very shallow water of about 0.5 meters deep on regular occasions. The Orange-Vaal Largemouth was then found quite a distance downstream and vice versa.

CONCLUSION AND THE WAY FORWARD

This information reveals that Orange-Vaal Smallmouth Yellowfish have very limited ranges (approximately 100m) and show very specific daily habitual patterns. This leads us to conclude that these fishes are territorial and do respond to changing environmental conditions on a daily basis. Finding additionally indicates that Orange-Vaal Largemouth Yellowfish has a bigger range than that of Smallmouth Yellowfish but they do not seem to move out of an area of approximately 3 km.

Tagging of new fish will take place in the next few months and a more focussed effort will be given to find spawning fish from September 2007 to February 2008. We would like to start including feeding biology and age related study to get a better understanding of the Yellowfish. For more information on this project or how to get involved please visit our website at www.yellowfishresearch.co.za

The resources which are available to this study will allow us to continue until early 2008. We would like to continue for at least another 18 months. If anyone can financially contribute to this research initiative to extend the study we will be able to generate a much clearer understanding of these two species. Please contact us.

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