

**ICHTHYOFAUNAL SURVEY AND
F.R.A.I.* FOR THE UMKOMAZI
RIVER, KWAZULU-NATAL**

**PROPOSED SAND MINING
OPERATION**

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**ICHTHYOFAUNAL SURVEY AND F.R.A.I. FOR THE UMKOMAAS RIVER,
KWAZULU-NATAL**

Contents

1. INTRODUCTION	3
2. METHODOLOGY	3
3. RESULTS AND DISCUSSION	6
4. CONCLUSION	12

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Front page image	Sample site on uMkomaas

1. INTRODUCTION

SDP Ecological and Environmental Services were appointed to undertake an ichthyological survey of a portion of the uMkomaas river, located upstream of the river's estuary and the town of uMkomaas (Figure 1). The findings of this investigation are reported herein and will inform an application for a water use license and mining permit for the removal of sand from the identified reach of the river. The subject section of the river lies downstream of an existing sand winning operation and much of the area appears to have been subject to mining operations in the past. According to the Desktop Present Ecological Status (PES) data from the Department of Water and Sanitation (DWS) (2012), the river reach in question (U10M – 04746) has a PES score of "B" and is considered to be largely natural. This, as indicated below, has however been superseded by the recent reserve determination.

The purpose of this survey is to provide an indication of the ichthyofaunal community present within the affected stretch of river, with a focus on identifying species that undertake migrations between river reaches and are prevalent generally within the general catchment. Potential impacts on such species are identified and mitigation measures in respect of the mining operations proposed. This ichthyological survey was a once off survey and an assessment undertaken during a spring period when river flow was low.

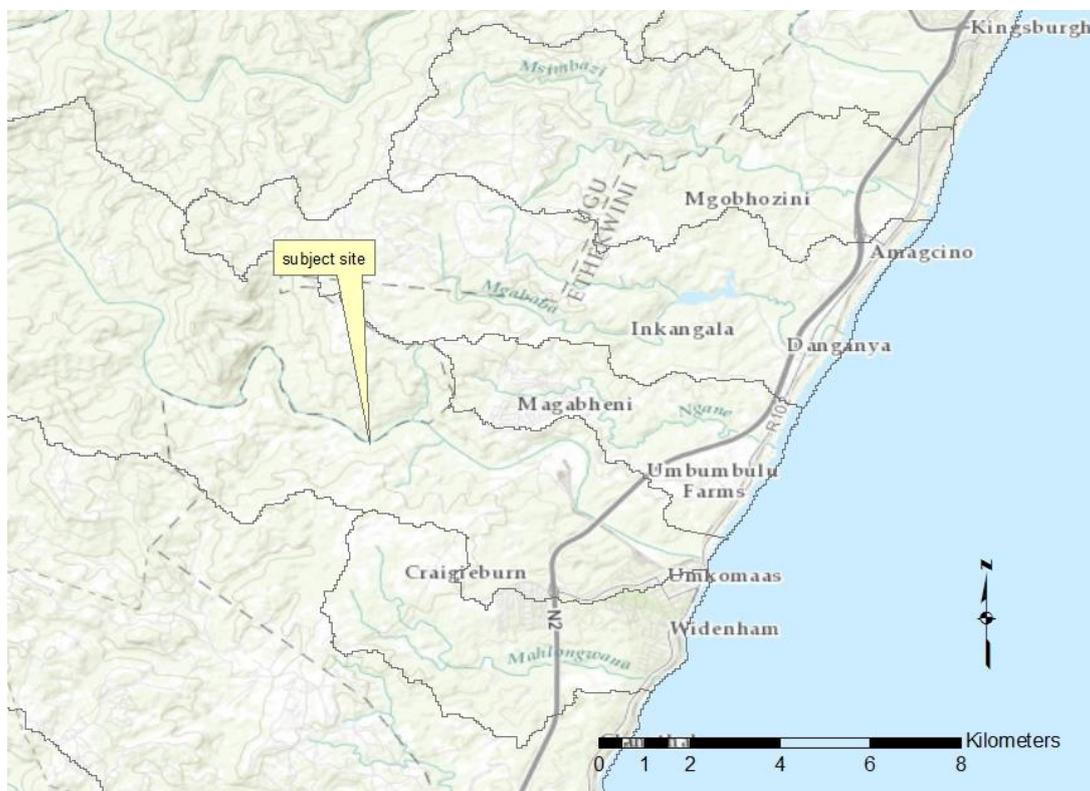


Fig 1. The location of the study site within SQ Reach 4746 on the uMkomaas River.

2. METHODS

Sampling was undertaken on the 11th of September 2019. A 160m stretch of river was sampled for a period of 1 hr, working upstream (Figure 2). The section of river sampled is situated directly downstream of the proposed sandmining area. The uMkomaas at this point is deep and rapidly flowing with accessibility being impaired. Sampling was thus concentrated within appropriate and accessible points. Fish were sampled using a SAMUS 725MS electro-fisher (F: 75 L: 1.50). This ichthyological survey was a once off survey and assessment was undertaken during a spring period when river flow was low.

Captured fish were identified to species level, quantified and released. The data was analyzed using the Fish Response Assessment Index (FRAI), Kleynhans (2008). By comparing the expected fish species (reference condition) with those captured at each of the sites as well as the nature of the habitat (and ecosystem drivers/metrics) at each site, the index serves to provide an estimate of the river reach PES or Ecological Category (EC) as indicated in Table 1. Reference frequency of occurrence data was determined from existing sample data obtained from the lower uMkomaas system U10M – 04746 (Kleynhans et. al 2008 and DWS 2012) (Figure 2).

Table 1. PES/Ecstatus ratings for river systems (Kleynhans et. al. 2005)

Rating	Description of river system
<i>A</i>	Unmodified, natural.
<i>B</i>	Largely natural. A slight change in ecological processes is discernible but the system remains largely intact.
<i>C</i>	Moderately modified. A moderate change in ecological processes has taken place but the system remains predominantly intact.
<i>D</i>	Largely modified. A large change in ecological processes has occurred and the system is appreciably altered.
<i>E</i>	Greatly modified. The change in ecological processes is great but some features are still recognizable.
<i>F</i>	Modifications have reached a critical level. Geomorphic processes have been modified completely.

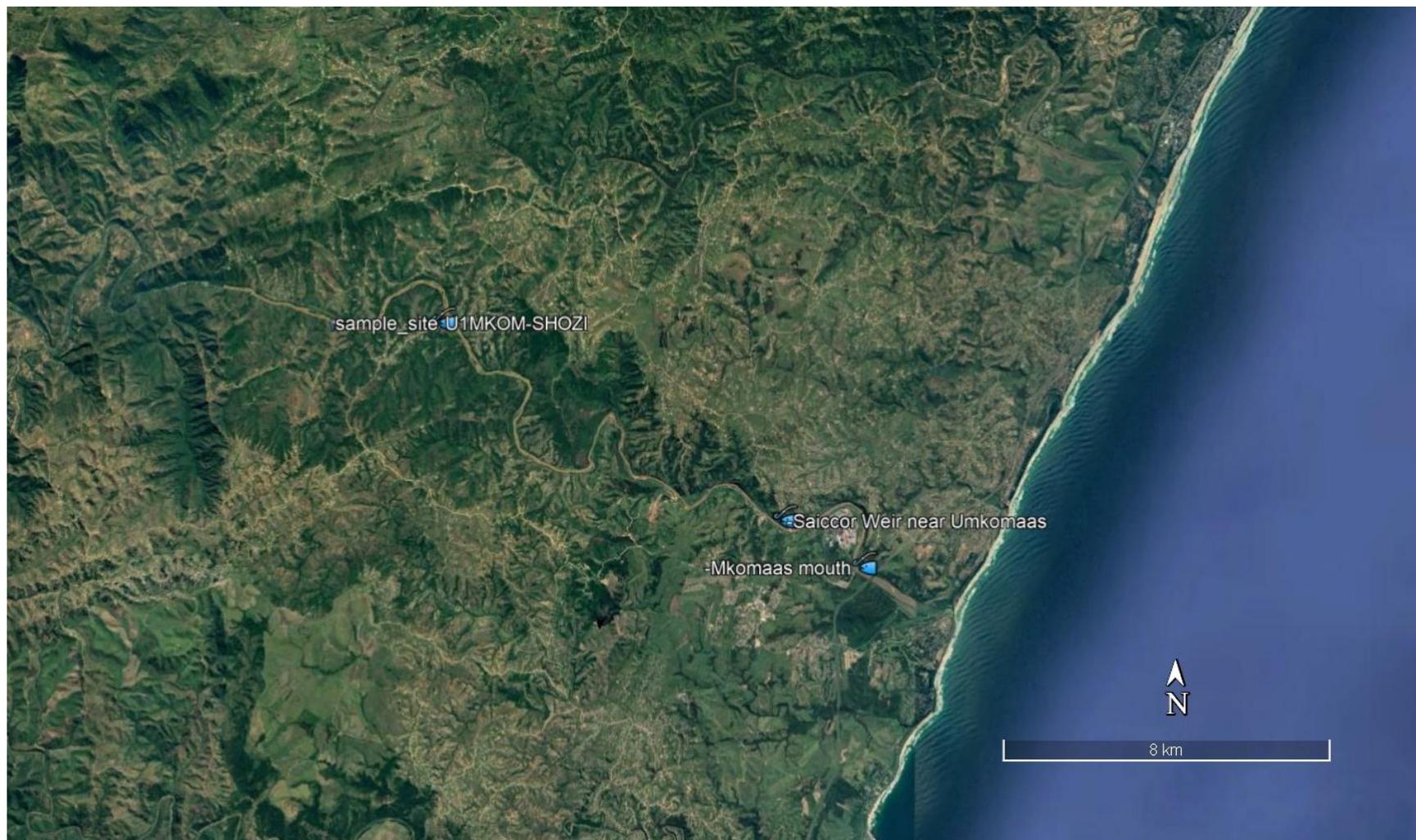


Figure 2. Google earth image showing DWS sample points in relation to Tugela sand mining site

3. RESULTS AND DISCUSSION

As indicated sampling was limited to inshore banks of the river due to accessibility and depth of channel with a strong current being evident (Figure 3). The sample data and evaluation are presented below.

3.1 Reference FROC

The species list, from which the reference frequency of occurrence (FROC), was determined using existing data from U1 MKO-SHOZI reference site (Table 1). Electro fishing in the system failed to identify any significant species with only the exotic guppy, (*Poecilia reticulata*) being evident. It is anticipated that access to deeper waters within the main channel would reveal a distinctly differing fish assemblage.

Table 1. Fish species recorded at the Shozi Weir upstream of the mining site. (DWS 2012)

Species	Common Name	Family
<i>Anguilla marmorata</i>	Madagascar mottled eel	Anguillidae
<i>Anguilla mossambica</i>	Longfin eel	Anguillidae
<i>Awaous aeneofuscus</i>	Freshwater goby	Gobiidae
<i>Clarias gariepinus</i>	Sharptooth catfish	Clariidae
<i>Cyprinus carpio</i>	Carp	Cyprinidae
<i>Enteromius anoplus</i>	Chubbyhead barb	Cyprinidae
<i>Enteromius viviparus</i>	Bowstripe barb	Cyprinidae
<i>Glossogobius callidus</i>	River goby	Gobiidae
<i>Labeobarbus natalensis</i>	Kwazulu-Natal yellowfish	Cyprinidae
<i>Oreochromis mossambicus</i>	Mozambique tilapia	Cichlidae

In a previous assessment undertaken close at hand by Whitehead in May 2019 *Labeobarbus natalensis* (Kwazulu-Natal yellowfish) was captured while the mine owner confirmed the presence of the following fish species in addition to *L. natalensis*:

- Sharptooth catfish (*Clarias gariepinus*)
- Eels (based on the description expected to be *Anguilla marmorata*)
- Carp (*Cyprinus carpio* – an exotic species)

For the above reason, the application of FRAI could not be undertaken, however given the anecdotal information at hand and supporting literature, some level of consideration of the system can be provided. Whitehead (2019), used the recent reserve determination identifying the system as

“moderately modified”, but suggested that from the perspective of fish diversity “*a deepening of the channel has provided greater depth, which suits larger fish species. The deeper channel also approximate reference conditions (based on the account provided by Begg 1978)*”. Whitehead also suggested that the high levels of sediment within the system is to be considered an aberration and that the removal of sediment may be beneficial to instream fauna, such as larger fish species. He also indicated that the change in depth associated with sand mining operations is likely to be temporary, as rates of sedimentation are high and the shallow, sediment dominated habitat of the lower Mkomazi River will return if and when mining ceases.



Figure 3. View downstream of sample site



Figure 4. View upstream towards mining site

3.4. Potential Impact and Mitigation

As indicated above, the nature of the uMkomaas River is such that it is a large river system that has undergone some level of transformation, much of this transformation being related to the high levels of sedimentation. It is therefore considered that sandwinning operations in the uMkomaas in the reach described is beneficial to the prevailing fish assemblages and allows for migratory habit in some species to be supported. However, access to mining areas on this river requires moderate to significant levels of bank modification. As such it is proposed that management of the mining operations at the proposed sandwinning site, should focus on management of the riverbank and maintenance of flow. Specific management controls should include:

- Singular and concentrated points of access into the river channel should be established.
- Mining of the river banks should be avoided and mining should concentrate on the bed of the system or deposition points within the channel.
- Mud banks and clay deposition points should be avoided, where encountered.
- Stockpiling of sediments in the river should be avoided, as well as curtailment of flow by the establishment of wide berms and dams.

4. CONCLUSION

It is recommended that mining be sanctioned on this portion of the uMkomaas River, subject to basic environmental management controls. The mining operations can be expected to improve depth and channel structure at points within the reach .

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