

## **Ecological niche modeling of the invasive potential of Nile tilapia *Oreochromis niloticus* in African river systems: concerns and implications for the conservation of indigenous congenics**

Tsungai A. Zengeya • Mark P. Robertson • Anthony J. Booth • Christian T. Chimimba

### **Abstract**

This study applied ecological niche models to determine the potential invasive range of Nile tilapia, *Oreochromis niloticus*, with a particular focus on river systems in southern Africa where it is now established and spreading. Computational tools such as niche models are useful in predicting the potential range of invasive species, but there are limitations to their application. In particular, models trained on native records may fail to predict the full extent of an invasion. This failure is often attributed to changes in either the niche of the invading species or the variables used to develop the models. In this study, we therefore evaluated the differences in the predictive power of models trained with different environmental variables, the effect of species range (native vs. introduced) on model performance and assessed whether or not there is evidence suggestive of a niche shift in Nile tilapia following its introduction. Niche models were constructed using Maxent and the degree of niche similarity was assessed using Schoener's index. Null models were used to test for significance. Model performance and niche conservatism varied significantly with variable selection and species range. This indicates that the environmental conditions available to Nile tilapia in its native and introduced ranges are not congruent. Nile tilapia exhibited broad invasive potential over most of southern Africa that overlaps the natural range of endemic congenics. Of particular concern are areas which are free of exotic species but are now vulnerable due to the promotion of fish introductions mainly for aquaculture and sport fishing.