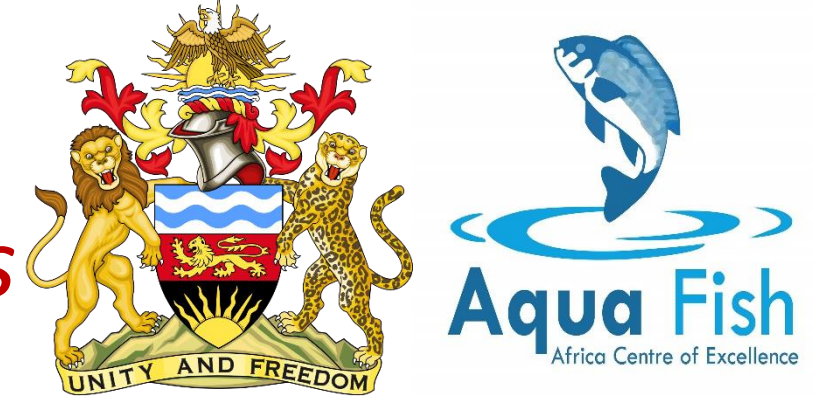
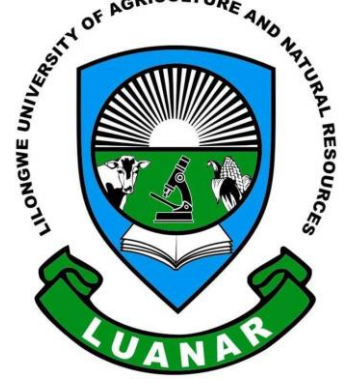


# COMBINING ABILITIES AND MODE OF GENE ACTION FOR GROWTH AND SURVIVAL TRAITS IN *OREOCHROMIS KARONGAE* (TREWAVAS, 1941) STRAINS FROM LAKE MALAWI

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## Introduction

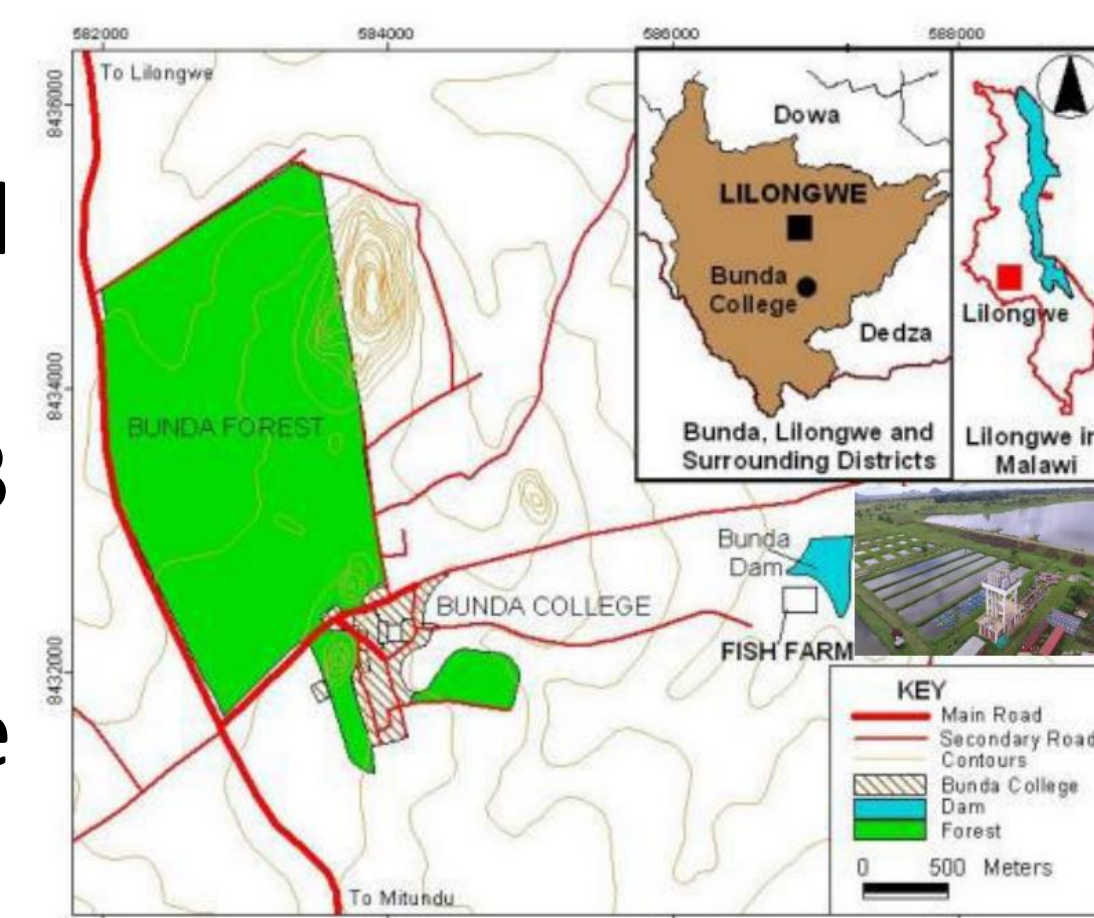
- Oreochromis karongae*, locally known as Chambo is one of the important farmed tilapias in Malawi.
- The species have poor growth as most of Malawi's tilapias.
- Using the GIFT technology of selective breeding, developed for the improvement of *Oreochromis niloticus*, *O. karongae*'s growth can also be genetically improved.
- But there is need to acknowledge that a genetic evaluation study of a species is prior to such genetic improvement programs.
- Combining ability analysis is one method used for the genetic evaluation of a species, genetic parameters of the species' different strains and their crosses are estimated and interpreted.
- An initial study for the evaluation of three strains of *O. karongae* obtained from Nkhatabay, Nkhotakota and Salima of Lake Malawi was conducted on the parental performance that invited a need for the current study which was conducted on the performance of the produced  $F_1$  nine crosses.

## Objective

Evaluating genetic parameters of  $F_1$  crosses of *O. karongae* and determining the species mode of gene action for growth and survival traits as a way to produce a base population for a breeding improvement program.

## Methodology

- The study was conducted at Bunda Fish Farm of Lilongwe University of Agriculture and Natural Resources, Malawi, Lilongwe.
- The bred nine  $F_1$  crosses from the three strains (denoted by NK, KK, SA) crossed in a 3 by 3 diallel cross were collected from breeding hapas and condition for 4 weeks period.
- The nine crosses were then stocked and replicated thrice in 27 1 by 1 meter hapas where observation and data collection was conducted.
- Data was collected and recorded every 2 weeks for a period of 3 months.
- Data on final weights, standard lengths, survival rates, standard growth rates and percentage weight gain as traits of emphasis were analysed for combining abilities
- The combining ability analysis was conducted in R using functions contained in DiallelAnalysisR and plantbreeding R packages and AGD-R software.



(a)

Cross	Male (♂)		
	NB	KK	SA
Female (♀)	NB	NB×NB	NB×KK
	KK	KK×NB	KK×KK
	SA	SA×NB	SA×KK



(b)

## Results and Discussion

- The combining ability analysis of the studied traits revealed significant ( $p < 0.05$ ) specific combining ability (SCA), general combining ability (GCA), maternal effects and reciprocal effects, suggesting the presence of genetic difference among the crosses
- Variance of SCA was higher than that of GCA suggesting a preponderance of non additive gene action on the studied traits.
- Independent GCA estimates of the parental strains suggested that Salima (SA) strain was a superior general combiner as it had higher estimates than the other two strains.
- GCA effects when the strain was used as either a male or female were estimated high in Salima strain but were not different between the strains female and male, indicating that the genetic contribution of the strain to offspring was not dependent of sex.
- Reciprocal effects of Nkhotakota (KK) strain supported the argument as the strain had high reciprocal effects meaning that its genetic contribution to offspring was dependent of sex, when the male was used in a cross it produced a better performing offspring than a female.
- Maternal effects revealed that Nkhatabay (NB) female had a higher genetic contribution to performance because of its high estimates.
- The reciprocal and maternal effects suggested a cross between Nkhatabay female × Nkhotakota male (NB×KK) would produce a better performing offspring, which was evident as seen in the SCA estimated and effect, the cross was revealed as a superior specific combiner.

## Conclusion and Recommendations

- A collaboration of both additive and non additive gene action was observed in the species but a more important in the control of the studied trait was determined to be non additive gene action.
- The genetic parameters (GCA, SCA, reciprocal and maternal effects) of  $F_1$  crosses of three strains of *O. karongae* revealed a genetic difference among the strains and crosses which shows an advantage of a potential exploitation of the difference
- The difference showed that Salima (SA) and the cross SA×SA as better strain and cross that could be exploited for additive genetic effect in a selective breeding program
- But non additive gene action being a more important control of the gene of the studied trait, researchers and fish breeders would be recommended to use the cross NB×KK as a better performing hybrid but for crossbreeding purposes rather than selective breeding



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