

PROGRESS REPORT OF THE SELECTIVE BREEDING PROGRAM IN MALAWI.
(As of 1st December, 2013).

1: Introduction

The WorldFish Center has managed a project on selective breeding of *Oreochromis shiranus* at the National Aquaculture Center, Domasi, and at Bunda College of Agriculture in Malawi, as part of the tilapia breeding program that the Center has embarked on. The Project is now breeding and testing the improved strains at Bunda College Farm and surrounding farms as a continuation of the work that has been carried out since 2001 which involved the production and growth performance testing of progeny for five generations. The current phase entails on-station production of the F₆ generation through single pair mating in hapas. On-farm production (using mass spawning in ponds) of the F₆ generation and their performance evaluation on-station and on-farm for growth using the farmers' strain as control, has also been done. This work is part of the effort in the dissemination process of the improved strain to farmers in Malawi through small scale multipliers.

1.1: Objectives

The objectives are to;

- Conduct on-station single pair breeding to produce an F₇ generation of *O. shiranus* using single pair mating in hapas.
- Test growth performance of the F₇ generation of *O. shiranus* in farmers' ponds
- Estimate genetic gain and response to selection in the F₇ generation of *O. shiranus*
- Evaluate the performance of the improved strains of *O. shiranus* on-farm
- Evaluate the growth performance of mass spawned on-farm fingerlings from the improved F₆ generation broodstock.

1.2: Terms of reference

Under the direction of the Project Manager, Dr. Alfred Maluwa, the WorldFish Center, Bunda College and National Aquaculture Center will carry out the following tasks:

1.2.1: Task 1

From 1st May, 2013, complete data analysis and the on-farm growth performance for the F₆ generation of *O. shiranus* and submit a report by June, 30th 2013. From 15th May 2013, conduct selection of the F₆ generation based on the breeding values of the fish and prepare the breeding plan and mating design to avoid mating of full and half sibs.

1.2.2: Task 2

From 1st June, 2013, condition the F₆ generation broodstock in concrete tanks and after 30 days, stock the fish in single pair mating hapas using hierarchical (nested design) in

which one male is mated with three females, collect and rear fry to fingerling stage and tag them after 90 days.

1.2.3: Task 3

From August, 1, 2013, select 10 farmers and set up mass spawning activities using broodstock of the improved F₆ generation.

In September, 2013, while fingerling production is in progress, train fish farmers and researchers on the methodologies of genetic selection, in order to minimize genetic contamination on-farm during progeny testing and seed multiplication. This will build the capacity of the farmers involved, so that farming of the improved *O. shiranus* strain can take place in an effective manner after the project is completed.

1.2.4: Task 4

In January, 2014, tag F₇ fingerlings and facilitate the distribution of the on-station and on-farm mass spawned F₇ generation for growth testing in mass grow out ponds. In April, 2014, collect and analyze data on the growth performance of the on-station single pair spawned and on-farm mass spawned F₇ generation during on-farm mass rearing in 20 selected farmers' ponds.

1.2.5: Task 5

Submit the final technical and financial reports by 8 December, 2013. Note however that the complete results for growth data will not be available until May or June 2014 (Task 4).

2: Progress as of 1st December, 2013.

2.1: Task 1: Complete F₆ data analysis and submit report

This activity was completed and a full report was presented in June, 2013.

2.2: Task 2: Select broodstock for 2013 breeding activities

Broodstock for the current breeding season was selected based on breeding values. The broodstock was conditioned between July and September, 2013 in preparation for the current breeding season. During the broodstock conditioning males and females were stocked in different earthen ponds. This activity i.e., conditioning of the F₆ generation started on 7th June, 2013 and was completed on 30th September, 2013. On 1st October, 2013 the broodstock was stocked in breeding hapas. The breeding design is single pair mating in which each female was allocated a male. The mating of closely related fish was avoided by using information from the coefficient of relationship among the fish during mate allocation. As of 1st December, 2013, a total of 15 full-sib families have been produced. They are being reared in separately in rearing 1 x 1 x 1 m³ hapas until they

reach tagging size and when all the planned 57 full sibs have been produced, probably by the end of December, 2013.

2.3: Task 3.1: Selection of farmers for on-farm spawning rearing activities

Farmers in the Central region districts of Dowa, Mchinji and Ntchisi were identified through the Community Approach Research Program (CARP) which is being funded through the Regional University Forum (RUFORUM) at Bunda College. This is a research consortium that groups all Universities in the East, Central and Southern Africa. The aquaculture component of the CARP project has chosen to use the improved strains of *O. shiranus* to reach out fish farmers in the Central region. The CARP project stocked two community fish ponds and 20 individual farmers' ponds using the improved F₆ generation. The farmers are breeding the fish using mass spawning techniques and are selling the fingerlings to other farmers. This collaborative work through Bunda College Department of Aquaculture and Fisheries Sciences has strengthened the dissemination component of the selective breeding project. Of the 20 farmers, 10 farmers were stocked with the fry from single pair mating and the fish were harvested after a growing period of 90 days. Body weight, age and sex were recorded on each individual fish at harvest.

2.4: Task 3.2: Training of fish farmers and researchers

Training of researchers, farmers and other stakeholders by Fisheries Department staff and Bunda College faculty was conducted from 18th to 19th November, 2013 in collaboration with the CARP project. This activity was shifted from September to November so that it coincides with the breeding season of the fish. Conducting the training in November has provided hands on experience to the farmers on fish breeding and fry rearing techniques.

2.5: Task 4: On-farm performance of F₆ generation

Manuscript from the research work has been submitted to the Malawi Journal of Aquaculture and Fisheries for Publication consideration. The manuscript are entitled "On-farm genetic parameter estimates and response to selection for harvest body weight of *Oreochromis shiranus* in the 5th generation." The manuscript is under review and is expected to be published in December, 2013.

3: Financial Report

Expenses incurred from June to October, 2013 and cumulative expenses from January to October, 2013 are summarized in Table 1.

Table 1: Expenses incurred from June to October, 2013 and cumulative expenses from January to October, 2013 (1US\$=MK320.6523).

No.	Line Item	Approved Budget	Expenditure (November to December, 2013)		Cumulative Expenditure January to December, 2013)		Budget Balance
		(US\$)	(US\$)	(MK)	(US\$)	(MK)	(US\$)
1	Salaries	4,500	1,000.00	848,913.22	4,500.00	1,522,283.05	0.00
2	Training	4,000	4,000.00	1,600,000.00	4,000.00	1,600,000.00	0.00
3	Communication	600	147.52	59,009.25	608.18	206,869.54	-8.18
4	Consumables	2,500	521.25	208,500.00	2517.25	848,500.12	-17.25
5	Travel	2,400	350.00	140,000.00	2,375.00	789,320.87	25.00
	TOTAL	14,000	3,039.00	974,478.37	7,982.66	2,559,464.32	-0.43

The original receipts have been sent by courier to Penang, Malaysia.