



# PD/A CRSP EIGHTEENTH ANNUAL TECHNICAL REPORT

## ESTABLISHMENT OF COMPANION SITES IN THE AFRICA REGION

*Ninth Work Plan, Adoption/Diffusion Research 4 (9ADR4)  
Progress Report*

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### ABSTRACT

The establishment of one or more companion sites in the Africa Region was proposed as a way of expanding regional efforts of the CRSP by assisting with the conduct of needed research at other sites in the region and of verifying the results of CRSP research at its site in Kenya. The objectives specifically listed for this effort in the Ninth Work Plan are 1) to identify and establish one or more companion sites for the Africa Region (year 1) and 2) to define and implement investigations at the companion site in support of PD/A CRSP and companion site goals (year 2). During the first year of the Ninth Work Plan (December 1998 to November 1999), CRSP Kenya Project personnel continued discussions with possible collaborators in Malawi, leading to a proposal to collaborate with the International Center for Living Aquatic Resources Management (ICLARM) at the National Aquaculture Center, Zomba, and with Bunda College, near Lilongwe. During year 2 an agreement was reached whereby two studies supported by the CRSP Kenya Project will be conducted in Malawi under the oversight of Dr. Daniel Jamu. One will be conducted at the National Aquaculture Center, and the second will be conducted at Bunda College. Work on the Zomba study began in May 2000.

### INTRODUCTION

The establishment of one or more companion sites in the Africa Region was proposed as a way of expanding regional efforts of the CRSP by assisting with the conduct of needed research at other sites in the region and of verifying the results of CRSP research at its site in Kenya. The objectives specifically listed for this effort in the Ninth Work Plan are:

- 1) To identify and establish one or more companion sites for the Africa Region (year 1); and
- 2) To define and implement investigations at the companion site in support of PD/A CRSP and companion site goals (year 2).

During the first year of the Ninth Work Plan (December 1998 to November 1999), CRSP Kenya Project personnel continued discussions with possible collaborators in Malawi, leading to a proposal to collaborate with the International Center for Living Aquatic Resources Management (ICLARM-Malawi) at the National Aquaculture Center, Zomba, and with Bunda College, near Lilongwe. (Veverica and Jamu, 2000). This report outlines progress made during the current reporting year, 1 August 1999 through 31 July 2000.

### METHODS AND MATERIALS

Discussions among Daniel Jamu of ICLARM-Malawi, Karen Veverica and Jim Bowman of the CRSP Kenya Project, Jeremy Likongwe of Bunda College, and other Kenya Project personnel led to the identification of two studies suitable for support from the CRSP Kenya Project early in the second year of the Ninth Work Plan (December 1999 to February 2000). Following this, in May 2000, a collaborative agreement between Oregon State University (OSU), representing the Kenya Project, and ICLARM-Malawi was signed. This agreement cleared the way for the transfer of funds and the beginning of work in Malawi. Under the agreement, one study will be conducted at each of the two collaborating Malawi institutions—ICLARM-Malawi and Bunda College of Agriculture—with supervision by Jamu and Likongwe, respectively. Aquaculture students from Bunda College will be heavily involved in both studies, with much of the CRSP funding going to their support. In-country oversight of both studies is being provided by Jamu.

Work on a study entitled "Effect of Stocking Size and Nutrient Inputs on Productivity of *Oreochromis shiranus* in Ponds" began at the National Aquaculture Center in late May. The objectives of this study are:

- 1) To determine the effects of different fish sizes on *O. shiranus* productivity;
- 2) To evaluate the effect of two different isonitrogenous input regimes on *O. shiranus* productivity and profitability; and
- 3) To recommend, based on objective 2, stocking strategies that optimize fish productivity.

Eighteen ponds were stocked at a density of 2 fish m<sup>-2</sup> with juvenile *O. shiranus shiranus* of three different sizes (5 g, 10 g, and 20 g). Two isonitrogenous input regimes (20 kg N ha<sup>-1</sup> wk<sup>-1</sup>) are being tested; these consist of: a) maize bran (3% of mean body weight per day) plus urea fertilizer and b) napier grass (50 kg dry matter ha<sup>-1</sup> d<sup>-1</sup>) plus urea fertilizer. Organic inputs (bran and napier grass) are applied daily whereas urea is applied weekly. All treatments are being done in triplicate. Fish (batch weight of 100 fish in the pond), total ammonia nitrogen, and chlorophyll *a* are measured biweekly; pH and electrical conductivity are measured weekly; and DO and water temperature are measured daily. The sampling is being implemented by a final-year undergraduate student from Bunda College of Agriculture in collaboration with students from the Malawi Fisheries College who are attached to the National Aquaculture Center. This work is directly supervised by Jamu.

At Bunda College, a study entitled "Use of Salinity to Increase Growth of Tilapia in Aquaculture" will be conducted under the supervision of Likongwe, Head of the Aquaculture and Fisheries Management Department. This work is of significance in Malawi because some areas currently considered to be marginal for fish production due to the presence of saline waters may have the potential for productive fish culture using species such as *O. shiranus shiranus*, *O. shiranus chilwae* (from pond and lake), *O. karongae*, and *Tilapia rendalli* if the relationships between fish growth and water salinity are better understood.

The objectives of this study are:

- 1) To determine the effect on survival of direct transfer into waters of different salinities for four taxonomic groups of tilapia: *O. shiranus shiranus*, *O. shiranus chilwae* (from pond and lake), *O. karongae*, and *T. rendalli*;
- 2) To determine the effects of different salinity concentrations on growth, feed conversion, and reproduction of tilapia; and
- 3) To identify salinity preferences of the above species at different sizes.

There will be five main experiments, each lasting 56 days, to examine survival, growth, and feed conversion of one of the species/subspecies cultured in four salinity concentrations (0, 10, 20, and 30 ppt). Five supporting experiments will examine the tolerance of these same species/subspecies to direct transfer into saline water, the duration of each depending on the ability of the fish to tolerate the test salinities. Each experiment will be

conducted indoors using 12 glass or fiberglass tanks. Each tank will be stocked with 16 fingerlings of uniform size (10 g). Tanks will be aerated using a blower, and fish will be fed on pelleted diets containing 35% crude protein. Sampling of fish to monitor growth in weight and length will be done every two weeks. Water quality variables (temperature, salinity, dissolved oxygen, un-ionized ammonia, hardness, and pH) will be monitored daily or weekly, depending on the variable. All species (except *O. shiranus chilwae*) will be collected from Bunda College.

## RESULTS

The stocking size experiment being conducted at the National Aquaculture Center was begun in late May and is expected to last approximately six months. Data are being collected as planned but will not be analyzed until after conclusion of the experiment. Fish weights from samples taken during the first two months of the experiment indicate that fish growth has been hindered by low water temperatures (18°C), which have persisted into the month of August.

The beginning of work on the salinity experiment to be conducted at Bunda College has been delayed. It is expected that this study will begin in August 2000.

## ANTICIPATED BENEFITS

Fish farmers in Malawi and the surrounding region will benefit from information gained through this research because researchers will be able to provide better guidance with respect to appropriate stocking densities and to the use of saline waters for fish production. Aquaculture students from Bunda College who are involved in the research will benefit by gaining first-hand knowledge of the culture characteristics of several aquaculture species important in Malawi as well as by learning research methods through their work with Jamu and Likongwe. The growth characteristics of species cultured in Malawi might be compared with CRSP findings from other sites. The CRSP Central Database will be broadened through the inclusion of data from additional sites in Africa. Companion site researchers will benefit from data collected during the course of experiments, and improved fish farming methods resulting from the experiments will be available for adoption by fish farmers in the area around the companion site. Ultimately, fish farmers in new areas will experience increased fish yields, and greater amounts of fish will be available for consumption in communities and markets in those areas.

## LITERATURE CITED

- Veverica, K.L. and D. Jamu, 2000. Establishment of companion sites in the Africa region. In: K. McElwee, D. Burke, M. Niles, X. Cummings, and H. Egna (Editors), Seventeenth Annual Technical Report. Pond Dynamics/Aquaculture CRSP, Oregon State University, Corvallis, Oregon, pp. 171-172.