

**PROGRESS REPORT OF THE NILE TILAPIA (*Oreochromis niloticus*)
AND FRESHWATER PRAWN (*Macrobrachium rosenbergii*)
SELECTIVE BREEDING PROGRAMS IN RIA2 – VIETNAM**

BY

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**REPORT COVERING THE PERIOD JANUARY TO DECEMBER, 2013
(INCLUSIVE)**

PRESENTED TO

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1. INTRODUCTION

The WorldFish Center is collaborating with the Research Institute for Aquaculture No.2 (RIA-2), Ho Chi Minh City, Vietnam, on the design and management of selective breeding projects with Nile tilapia (*Oreochromis niloticus*) and freshwater prawn (*Macrobrachium rosenbergii*). In 2006, RIA-2 received representatives from 50 GIFT families from Jitra, Malaysia. These fish provided the foundation for the tilapia selection program currently underway in RIA-2, which includes testing of a simplified version of the GIFT technology. With regards to freshwater prawn, RIA-2 has conducted extensive studies characterizing the stock available in Vietnam, and has very good facilities for the conduct of a selection program with this species. This project complements efforts currently being made for the genetic improvement of the species in China, India and Malaysia.

2. OBJECTIVES

The objectives of these Projects are to:

For Nile Tilapia (*Oreochromis niloticus*):

- Harvest generation 4 of GIFT in RIA-2 of Nile tilapia produced from GIFT generation 10 broodstock that received from WorldFish in 2006. Collection of growth data. Estimation of breeding values, ranking of families and individuals.
- Select brood stock candidates for production of generation 5 in RIA-2.
- Conduct on-station field work to produce generation 5 in RIA-2 using single pair mating in hapas.

For the freshwater prawn (*Macrobrachium rosenbergii*):

- Conduct family production to produce generation 5 for selection, from the fourth generation established in 2011.
- Grow-out, harvest and data collection. Estimation of breeding values, ranking of families and individuals.
- Selection of brood stock from the best performing individuals, irrespective of the origin of the individuals.
- Statistical analysis of data collected from generation 5.

3. TASKS

Under the direction of the Project Manager, Dr. Nguyen Van Hao, and of The WorldFish Center staff, RIA 2 staff will carry out the following tasks:

3.1. Task 1

For GIFT: By 30 April 2013, complete (i) harvesting all the GIFT generation 14 fish (the fourth generation of GIFT_RIA-2 of Nile tilapia produced from GIFT 10 brood stock received from WorldFish), (ii) collection of growth data, (ii) estimation of genetic parameters and (iv) selection of broodstock for next generation. Thereafter conditioning the GIFT brood stock; stock the fish in single pair mating using hierarchical (nested design) in which one male will be mated with two females, in order to produce families for the next generation. By September 18th 2013, complete production of 70 families for the next generation of GIFT. Thereafter conduct nursing of fry until tagging size. Tagging of fingerlings will be conducted in October 2013. Per family, fifty fish will be tagged. Grow-out will be conducted from 16 October 2013 until 15 March 2014.

For Freshwater Prawn: By June 30th 2013, complete the family production of generation 5. There will be a total of 80 mating pairs. The success rate of mating is 60%.

3.2. Task 2

For Freshwater Prawn

By July 31st 2013, establishment of the base population consisting of at least 50 families for selection.

3.3. Task 3

For freshwater prawn

From August until December 31st 2013: Completion of tagging of families; culture of the marked prawn in earthen pond and data collection. Estimation of genetic parameters and selection of brood stock for next generation.

4. PROGRESS FROM JANUARY TO DECEMBER, 2011 (INCLUSIVE)

4.1. FOR GIFT FISH

Fish of GIFT generation 14 (GIFT 14) were stocked for grow-out in October 2012. Harvest of GIFT 14 fish was started on March 11th and completed on March 22nd 2013. In total, there were 3135 fish harvested that belong to 93 families. Growth data including harvest body weight, length, height, and depth were recorded. After harvest, fish were stocked into a 2000 m² that divided into two compartments, single sex cohort. Heritability (h^2) was estimated at 0.34 ± 0.17 , and environmental effects common to full-sibs (c^2) was estimated at 0.12 ± 0.06 . Estimated breeding value (EBV) was calculated for all harvested fish.

Selection of candidate broodstock was carried out in May 2013. In total, 315 candidate broodstock, consisted of 215 females and 100 males from 54 families, were selected based on their EBV for harvest weight. These 54 families have highest mean EBV out of the total 93 families. In addition, 20 fish (1 female and 1 male in each family) from 10 families were selected to produce the control group. These 10 families have (mean) EBV at the average level of the whole population. Thereafter, conditioning of candidate broodstock and broodstock for the control group was conducted immediately, starting on July 1st 2013.

Family production started on August 10th, and finished on September 20th. In total, one hundred and five full-sibs families were produced, consisting of 42 pairs of paternal half-sib (equivalent to 84 full-sib families) and 21 full-sib families (that is, without a corresponding half-sib family).

Tagging of individuals was conducted at fixed age, that is, fish that reached 30 days old (body weight ranged from 5 – 10 g) were tagged. Therefore, tagging was carried out from October 20th to November 30th. Per family, fifty fish that reached were tagged. Grow-out started on December 10th to date.

4.2. FOR FRESHWATER PRAWN

4.2.1. Task 1

From January to February 02nd 2013, broodstock of giant freshwater prawn were being conditioned in 100m² hapas, single sex cohort, at a density of 2 prawns per square meter. Broodstock were fed twice daily, the first time with commercial prawn pellet feed (35% crude protein), and the second time with chopped beef liver, squid or flesh marine fish.

In total there were 615 males and 326 females, belong to 80 families. At the end of the conditioning period, mean weight was 38 g for females, and 85 g for males. Survival rate was 68% for females, and 49% for males.

In order to shorten the mating time of producing full-sib and half-sib family, a GIFT method was applied where 5 to 8 healthy females from two families were stock with 1 male from another family in a 4m² mesh mating hapa submerged to a depth of 0.8 m in an earthen pond. All mating hapas were checked weekly, if at least one female from either family was successfully mated (berried female) the male would be removed. In this case, the paternal half-sib have been established. If one or more females were mated but they came from a same family, all other females from that family would be removed; females from a second family would remained with the male until end of mating period for producing half-sib families. If a male die during the mating period, another male from same family would be replaced. If more than one female from a family were mated, one

would be used to produce full-sib family and others as the backup in case larvae rearing failed in the target family.

All berried females at check were removed as a batch into a larger (30 m²) mesh hapa at a stocking density of 1 per square meter to avoid unnecessary disturb from checking activities. As they all were tagged, they were easily traced back to their mating. Berried females were checked 10 days after restocked into these hapa and one or two days interval after the first check. When the berried eggs changed colour to dark grey they were ready to spawn. Ripe females (i.e. fully mature ovaries) would be transferred to the hatchery for spawning.

4.2.2. Task 2

Family production was conducted from February 07th to March 01st 2013. In total, 62 full-sib families were produced from 70 mating pairs. Larvae from these families were nursed from February 17th until April 19th 2013. At the end of the nursing period, 61 families remained (only 1 family was lost), and mean survive rate of post larvae (PL) was found to be at 30%. Thereafter, PLs were nursed until tagging size (~ 3 g) from April 20th to June 17th 2013. In total, there 28,340 PLs were nursed. At the end of the (PLs) nursing period, mean survival rate was found to be at 66%.

4.2.3. Task 3

Between June 17th and July 05th 2013, all 61 full-sib families were tagged with visible implant elastomer (VIE) applying the protocol that has successfully been used. In total, 17,200 juveniles (mean body weight of 3 g) were tagged with two marks using 6 different colours. Immediately after tagging, tagged prawns were stocked into a 6,000 m² earthen ponds for grow-out.

Harvest of generation 5 was conducted from November 22th to December 03rd. In total, 5,821 individuals that representatives 60 full-sib families were obtained. Mean body weight (mixed sex) was 33.6 ± 17.6 g (female 27.5 g and male 43.9 g).

Thereafter, selected individuals (2,317) were tagged with a second VIE tag, allowing individual identification possible. Candidate parents, including 152 males and 591 females, were conditioning in hapas installed in a 6,000 m² pond, single sex cohort. Family production of generation 6 is planned in January 2014.

5. PLAN OF NEXT ACTIVITIES IN 2014

For GIFT

- Harvest generation 5 and collection of growth data,
- Estimation of genetic parameters and selection of brood stock for the next generation.

For giant freshwater prawn (GFP)

- Family production of generation 6,
- Harvest generation 6 and collection of growth data,
- Estimation of genetic parameters and selection of brood stock for the next generation.

6. EXPENDITURE