8.8 Establishment of national broodstock centres in Viet Nam

Nguyen Cong Dan
Sustainable Development of Aquaculture (SUDA)
Fisheries Sector Program Support Phase II
Ministry of Fisheries, Hanoi, Viet Nam
ncdan2005@yahoo.com
Dan Griffiths
Sustainable Development of Aquaculture (SUDA)
Hanoi, Viet Nam.
don.suda@mofi.gov.vn, dongriffiths@fastmail.fm

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ABSTRACT

A rich natural aquatic resource base, extensive water resources and coastline and supportive government policies are the basis for Viet Nam tripling fisheries production between 1990 and 2005.

The planned move by the Government of Viet Nam (GOV) from state run and controlled fish seed production systems to a free market economy with private hatcheries producing the majority of aquatic seed production, have also contributed greatly to the rapid aquaculture development.

The GOV is initiating an aquatic seed development programme to 2010 through a network of national 'level 1' and provincial hatcheries that will service the aquaculture industry on a cost recovery basis. Activities include long-term genetic breeding programmes, the dissemination of improved aquatic seed, farmer training, research and the conservation of germplasm and artificial breeding of endangered aquatic species.

The Support to Freshwater Aquaculture component of the GOV/Danida Fishery Sector Programme Support (FSPS) funded key consultancy input, staff training, equipment and research and development activities at the three national broodstock centres (NBC) in Viet Nam, the details of which are provided in this paper.

BACKGROUND

Viet Nam's dynamic fishery sector has been encouraged by the country's rich natural resources including 3 260 km of coastline and an exclusive economic zone of 1 million km^2. Viet Nam has a registered fishing fleet of just over 90 000 powered vessels (MOFI, 2006).

Viet Nam has an estimated 120 000 ha of ponds, 340 000 ha of lakes and reservoirs and a further 540 000 ha of rice fields which could potentially be used for freshwater aquaculture. Similarly, Viet Nam has approximately 660 000 ha of tidal area and 400 000 ha of lagoons which could potentially be used for brackishwater aquaculture.

The fishery sector is one of the most dynamic and fastest expanding sectors in Viet Nam with growth in excess of 10 percent per annum. Currently, the fishery sector contributes 4 percent to the Vietnamese gross domestic product, provides full time employment to over 4 million people and part-time employment to many millions more.

Vietnamese total aquatic production tripled between 1990 and 2005, reaching 3.4 million tonnes in 2005, with 1.8 million, 1.4 million and 0.18 million tonnes from marine capture, aquaculture and inland capture fisheries, respectively (MOFI, 2006). In 2005, 0.93 and 0.33 million tonnes of fish and shrimp were cultured; the same year when Viet Nam exported US$2.65 billion worth of aquatic products.

With aquatic products providing 40 percent of the animal protein in the Vietnamese diet, the fishery sector is also vitally important for food security and nutritional quality.

HISTORY OF SEED PRODUCTION

Prior to early 1980s, the state provided the resources, subsidized, controlled and managed fish seed production in Viet Nam. In the late 1980s, in its move towards a free market economy, the market reforms of the Government of Viet Nam (GOV) promoted the formation of private seed producers who were mobilized by profits, while state hatcheries were also converted to profit orientated joint stock companies.

In the 1990s, the GOV identified that although government and private sector hatcheries were producing sufficient freshwater fish seed, the quest to maximize profits had resulted in a deterioration of seed quality caused by inbreeding, genetic drift and other factors. In addition, aquaculture development was constrained by the difficulty in enforcing seed quality management guidelines and/or regulations, seed being unavailable when needed for stocking and because of inappropriate management practices.

To counter this, the Prime Minister launched an ambitious aquatic seed development program to the year 2010 (GOV, 2004) with a target production of 16.7 billion fry by 2010. The program included the upgrading of three national broodstock centres (NBC) with a remit to improve seed quality and which were to operate on a cost recovery rather than a profit basis. The three NBCs are located in Hai Duong province in northern Viet

Nam, in Tien Giang province in southern Viet Nam and in Buon Ma Thuat province in central Viet Nam.

COURTESY OF JOE GARRISON FOR MRC

Family rearing of 'tra' (*Pangasius hypophthalmus*) at National Broodstock Centre 2, Tien Giang province

The aquatic seed development program also includes the following: (i) upgrading 11 "level 1[1]" freshwater multiplication seed centres (four in the north, three in the centre and four in the south), (ii) the upgrading of provincial hatcheries, (iii) the strengthening of staff capacity through provision of training, (iv) the creation of concentrated seed production zones, (v) the strengthening of seed quality management and (vi) the implementation of specific research and development programmes on seed production.

[1] Level 1 is a hatchery center servicing several provinces.

The GOV has assigned the three NBCs with the following responsibilities:

- collecting and maintaining the best germplasm of key aquatic species;
- maintaining stocks to minimize inbreeding and genetic drift;
- gene banking and domesticating endangered species;
- developing improved broodstock management and seed production techniques;
- conducting national breeding programmes;
- disseminating improved strains and/or species; and
- training of hatchery operators nationwide.

The Support to Freshwater Aquaculture (SUFA) component of the GOV/Danida Fishery Sector Program Support (FSPS) funded a series of international consultancies to support the upgrading of the NBCs. The SUFA consultancy provided input on the designing and equipping of NBCs, quantitative genetics, seed quality management and evaluation, satellite markers, cryo-preservation and business and production planning.

During a series of workshops facilitated by SUFA staff and international consultants, key fish species at the three NBCs were classified into three categories for differing development strategies. These were as follows:

Class A: priority species for genetic improvement;
Class B: priority species for genetic management to avoid deterioration of stocks; and
Class C: species for which refresher introductions could easily be made either from domesticated and/or improved stocks, or from the wild.

The selection of Classes A, B and C fish species for NBC1 (north) and NBC2 (south) are shown in Tables 1 and 2 below.

At the time of going to print the current situation is that NBC1 (north) has been completely upgraded with GOV funds, equipped and is operating at full capacity. The NBC2 (south) has been fully supplied with SUFA funded equipments, while upgrading funded by GOV funds is underway and will be completed in early 2007.

Construction of NBC3 was delayed and not started when SUFA finished at the end of 2005. However, to meet the increasing demand for freshwater fish seed in the central region, SUFA funded the installation of a fibre-glass tank-based hatchery system at Quang Hiep and provided a full set of equipments for use when NBC3 construction is completed.

The equipments supplied by SUFA were chosen by the respective NBCs themselves and included passive integrated transponder (PIT) tags and readers, water quality and disease testing equipments, closed recirculation systems with bio-filter and ultra-violet sterilization and automatic feeders. SUFA also funded two licences for each of the three Research Institutes of Aquaculture (RIA1, RIA2 and RIA3) for six years for Genstat and ASReml, two quantitative genetics analysis software programs.

SUFA supported field trips, training and workshop attendance for NBC and RIA staff, and in 2005, SUFA funded part of the NBC1 and NBC2 research and training costs against the business and production plans of each institute.

Single pair tilapia spawning hapas at National Broodstock Centre 2, Tien Giang province

COURTESY OF TRINH QUOC TRONG

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Checking a PIT (passive integrated transponder) tag with a reader before insertion into a 'tra' (*P. hypophthalmus*) broodstock fish

Specific SUFA-supported activities at NBC1 (north) included:

- funding the re-importation of 50 000 P33 and 50 000 Amur common carp fry from Haki, Hungary and 20 000 grass carp and 20 000 silver carp from China;
- funding long-term mrigal and grass carp breeding programs;
- facilitation by NBC1 staff with support from a team of quantitative geneticists of detailed breeding plans for grass carp, common carp and tilapia at NBC1; and
- supply by NBC1 of improved grass carp and mrigal fingerlings to 11 hatcheries in the north of Viet Nam to be grown on as future broodstock.

Specific SUFA-funded activities at NBC2 (south) included:

- long-term selective breeding program for *Pangasianodon hypophthalmus* ('tra') which initially focused on growth and later fillet yield; three year classes of broodstock have been produced with over 100 families of each grown-on;
- selective breeding program for Genetically Improved Freshwater Tilapia (GIFT tilapia) with broodstock with the best estimated breeding values (EBVs) mated in 2005 and seed from over 100 single pair matings being grown-on;
- Facilitation by NBC2 staff with support from a team of quantitative geneticists of detailed breeding plans for tra, tilapia, *Macrobrachium* and silver barb at NBC2.

In addition, the NBCs have also received funding support from the:

- DFID Aquaculture and Fish Genetics Research Programme (AFGRP) 2000- 2004 which focused on carps;
- GOV for a gene banking program 1996- 2000 and Phase 2;
- International Network for Genetics in Aquaculture (INGA); and
- Aquaculture of Indigenous Mekong Fish Species (AIMS) of the Mekong River Commission.

It is anticipated that the Sustainable Development of Aquaculture (SUDA) component of the Fisheries Sector Program Support Phase II funded by the GOV and Danida will work collaboratively with the three NBCs of Viet Nam to continue their further development as genetic centres of excellence for quality fish seed.

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