Large Fish Seed for Small-Scale Aquaculture

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The Problem of Predators

Disappearance of stocked fish is a common problem affecting farmers' efforts to manage ponds and ricefields in northeastern Thailand. A survey of over 500 fish farming families in Udorn Thani revealed that seed purchased from government or private suppliers showed poor survival after a few months growout in typical pond and ricefield systems (AIT 1990a, 1990b). The ever present piscivorous fish such as snakehead (*Channa striata*) and climbing perch (*Anabas testudineus*) undoubtedly decimate the small carp and tilapia fry (total length 2-3 cm) available to farmers. Predatory fish are practically impossible to exclude from culture areas and are themselves a valuable part of the harvest, highly prized by farmers.

The stocking of larger fingerlings nursed from fry is a logical step to improve the survival of stocked fish: mainly a mixture of native (*Puntius gonionotus* and *Cyprinus carpio*) and exotic carps (*Cirrhinus mrigala* and *Labeo rohita*) and tilapia (*Oreochromis niloticus*), but fish of this size are not currently available from private or government suppliers.

The production of larger, more predator-resistant seed within the village has many advantages compared to nursing fry to fingerlings in large central hatcheries. Quite apart from the greater efficiency of moving small rather than large fish seed into rural areas, it also permits farmers to become involved in 'value added' nursing.

Nursing fry to fingerlings using conventional techniques at the village level has rarely been sustainable. Success has evaded even the most enthusiastic extension workers. The preparation of nursery ponds is a specialized business requiring outside inputs and a reliable water source. Moreover, most farmers in this predominantly rainfed area balk at draining and drying a pond in the dry season for preparation as a fry nursery. Elimination of predatory fish using pesticides and/or quicklime is difficult and costly. These constraints have effectively prevented individual farmers from nursing their own fry to fingerlings in ponds. Group-operated nursery ponds, in which resources are pooled, suffer social constraints that prevent sustainable output.

The Solution: Appropriate Nursing Technology

A 'user-friendly' nursery technology is required that is neither complex nor requires expensive inputs. Fry traders in the Bangkok area already use large *hapas* of 5-40 m^2 to hold fry conveniently at high density for short periods before sale. Such *hapas* were tried for longer nursing in farmers' ponds. Nursing fry to fingerlings in six to eight weeks proved to be a versatile, low-cost and economic method for individual farmers. A *hapa* can be placed in the corner of a fishpond or ricefield sump, or wherever there is enough water to begin nursing fry early in the season. The *hapa* nylon material is already used by farmers, typically for making fishing gears or for *hapas* for holding fish temporarily after harvest.

Field trials managed by farmers have been underway over the past two growing seasons (1989, 1990) in Udorn Thani to develop methods for wider adoption by farmers in northeastern Thailand. Using nursery *hapas* is one of several strategies being developed by the Asian Institute of Technology (AIT) and Thai Department of Fisheries to improve small-scale aquaculture in this area (Edwards et al. 1990).

To field-test the *hapa* idea, AIT staff asked farmer-cooperators to follow a set of recommendations based on previous on-campus research (e.g., Sirisai 1988, Sodsook 1989) and on the wide experience of the multidisciplinary project staff. Farmers were advised to nurse a polyculture of herbivorous/omnivorous fry at a stocking density of 150/m^2 in 50-70 cm deep *hapas* of either of two sizes (approximately 5 or 20 m^2). The nursing period suggested was six to eight weeks until the fish reach a total length of about 5 cm. Farmers were encouraged to feed a high-quality diet: a ratio of a poultry concentrate to fine rice bran of 2:1 by volume, twice daily. Although expensive, the quantities fed were small, thereby intensifying a small but very important part of the fish culture cycle. Prior to working with farmers, all the methods had been tested on-campus in simulated on-farm conditions.

Present Status

Over 80 farmers have now followed the project's recommendations and successfully nursed fish to the desired size over the past two years. Many farmers have expanded their nursery operations to more than one *hapa* and all farmer-cooperators of the first year continued to nurse fry in *hapas* in the following year.

When examining the success of this technology for the small-scale farmer in this poorest area of Thailand, it is important to note that the project offered no financial assistance to the farmers

and that no artificial markets for fish seed were created. Adoption will continue to be monitored with on-farm trials during the third and final year of the project and extension materials will be further refined for use by government and nongovernment extension agencies.

Acknowledgement

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Africa Section

Simple Method for Year-Round Breeding of *Clarias gariepinus*

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Introduction

Clarias gariepinus has become widely cultured in Nigeria. It is easily bred in captivity but there are insufficient fingerlings to meet farmers' demands. A fishery for wild-spawned fry has constituted the major alternative source but is unreliable as *C. gariepinus* exhibits seasonal spawning (Bruton 1979; van Oordt and Goos 1987). Wild fry and fingerlings are available only in the rainy season (May to October).

This also applies to captive breeding. Induced spawning works only in the wet season (Huisman and Richter 1987). There have been attempts to simulate in captivity the conditions under which *C. gariepinus* spawns in the wild, with the aim of having year-round supply of fish seed. These have included manipulation of photoperiod and temperature (Huisman and Richter 1987) and simulation of flood and rain conditions, as suggested by Bruton (1979) and used successfully by Areerat (1987) for *C. batrachus*.

The fish-rearing facility of the Federal Fisheries School of the Nigerian Institute for Oceanography and Marine Research (NIOMR). The reservoir is in the background. (Photo by Segun Alegbeleye)

Installations d'alevinage de l'Ecole fédérale de pêches de l'Institut nigérian de recherches océanographique et marine (NIOMR). Le bassin est à l'arrière plan. (Cliché : Segun Alegbeleye)

This communication describes a simple method for the year-round production of *C. gariepinus* fry in homestead concrete tanks. The work was part of a training program for Higher National Diploma (HND) students of the Federal Fisheries School of the Nigerian Institute for Oceanography and Marine Research (NIOMR).

Methods

The facilities consisted of nine gravity-fed concrete tanks: six rectangular (5 x 4 x 1 m), two circular (12.6 m^3) and a reservoir (8 x 5 x 1.5 m). The rectangular tanks were arranged in two parallel rows, connected to