Peter Edwards writes on

Rural Aquaculture

Myanmar revisited

Dr Edwards is a consultant and Emeritus Professor at the Asian Institute of Technology in Thailand where he founded the aquaculture programme. He has over 30 years experience in aquaculture education, research and development in the Asian region. Email: pedwards@inet.co.th.

Background

Rarely do I receive feedback on my columns but 'Comments on possible improvements to carp culture in Andhra Pradesh' (Aquaculture Asia Volume XIII, Number 3, pp. 3-7, 2008) has generated considerable interest: several colleagues contacted me, the column has been reprinted in the Indian magazine 'Fishing Chimes' (Volume 28, No.7, pp.10-14), and I was invited by U Tin Maung Thann, Vice President of the Myanmar Fisheries Federation (MFF) and U Than Lwin, Chairman of the Myanmar Fish Farmers Association to visit Myanmar last September to present in person my impressions of rohu farming in Andhra Pradesh, India, to compare it with rohu farming in Myanmar, and to make suggestions as to how current practice could be improved in their country. It was especially nice to have a chance to interact again with Tin who was my Masters degree student in the early 90s. Following graduation he was employed for several years in AIT's Outreach program, experience which he's putting to good use in Myanmar.

Fingerlings being transferred from boat to grow-out pond.

I readily agreed to this kind invitation on condition that I be taken on a field trip to revisit rohu farms, although I had visited the country three years ago ('Rural aquaculture in Myanmar', Aquaculture Asia, Volume 10, No.2., pp. 5-8). I was taken on a most impressive three day field trip by my two hosts, as can be judged from the photos of the wide range of activities. This was followed by an all-day workshop held at the MFF on 'Improving rohu aquaculture systems in Myanmar'.

I also joined a field trip arranged by Myanmar Egress into the Ayeyarwady delta with a group of German and Swiss donors who had financed the reconstruction of houses and a school for victims of Cyclone Nargis. The cyclone caused a tidal wave of about 5 metres to sweep through the delta in May 2008, causing widespread death and destruction. I was able to meet small-scale farmers who had been severely affected by the cyclone, including some who had been involved in rohu culture. On the last day of my week's visit I gave a seminar, 'Promising development strategies for small-scale aquaculture in Nargis affected areas'. The seminar was attended by about 30 people, including representatives from major NGOs involved in rehabilitation programs. As with the rohu workshop, I felt uneasy pontificating about aquaculture in the country based on only a few days of experience.

Large-scale farms

The following discussion on carp farming in Myanmar is based on the three day field trip and on information provided by farmers at the workshop. There are major similarities as well as differences between the systems in Andhra Pradesh and Myanmar. Both are rohu dominated with similar high total production and high yields. Several hundred thousand tonnes of carp are currently being produced mainly by about 3,000 large-scale farmers in Myanmar on a total area of over 80,000 ha with an average yield of 4.5 tonnes/ha although better farmers (32,000 ha) claimed to produce 12.5-16.0 tonnes/ha. Farm gate prices are similar in both areas, about US $1/kg.

Returns from fish farming were high initially in Myanmar but are falling now with rising feed costs (60-65% of total operating costs) and increasing competition in export markets. Hence the reason for my invitation to compare farming practices in the two areas and to suggest possible ways to improve technical and financial efficiency in Myanmar.

The major seed producing area in Myanmar is in Kayan, east of Yangon, where 200 nursery farms cover 800 ha as well as a similar area of grow-out ponds. This was the first area developed for carp culture in the country, with fish ponds constructed in a rice growing region. As there was insufficient area for expansion, 17,200 ha of grow-out ponds were later built on undeveloped land in an area previously insecure due to insurgency in Twante to the west of Yangon. Some of the current farmers were formerly rice farmers, although many of today's fish farmers entered aquaculture from other professions.

At the Ayeyarwady Advanced Freshwater Fish Hatchery, U Win Kyaing has developed an improved breed of rohu. Wild stock were collected from the Ayeyarwady river in 1996 and through selective breeding the growth rate is now 50% faster than that of commonly farmed stock, the fry and fingerlings are stronger and swim faster, and growth in grow-out is 10-15% higher. Furthermore, the attractive reddish coloration and shape of fish fetch a higher price in both local and export markets.

As in Andhra Pradesh, it takes two seasons to produce table size fish as fingerlings are first stunted and then are grown out in a separate pond system. Fingerlings of 2.5 cm size

My hosts and guides U Than Lwin (foreground) and U Tin Maung Thann (background).

Fingerlings being transported in the aerated hold of a boat.

Powdered feed being loaded into a nylon net feeding basket.

are purchased from hatcheries and nursed in monoculture. at a relatively high density to 12.5-15.0 cm or about 10 g in nursery farms during the first year. Stocking density of fry in nursery ponds is 375,000 ha or 37.5/m^2 with rohu comprising about 95% of fingerling production.

Feeding efficiency is likely to be low.

Feed may also be offered to fish in perforated sacs suspended in the pond.

Pelleted feed is increasingly used.

Various reasons were given for stunting, even though some farmers believe it is possible to grow rohu to marketable size in one year: as former livestock rearers, they observed that older animals are stronger and grow faster than small animals; stunting produces uniform sized fingerlings; if they stock small fingerlings in grow-out ponds, the stocked fish will disappear from predation; and the logistics of transporting fingerlings from Kayan to Twante by boat which can only be carried out from the end of May until December when there is sufficient water in the river system. Furthermore, the water level in low-lying Twante is too high to drain the ponds for advanced nursing to take place there; ponds can only be drained in the dry season, by gravity with the remaining 15 cm of water pumped out.

Most grow-out farms are large, ranging in total area from 20-600 ha with an average farm size of about 80 ha. Pond size ranges from about 20-88 ha. Pond depth is 1.5-2.0 m. As in Andhra Pradesh, farmers believe that 'bigger is better'. Although large ponds are easier and cheaper to build than small ponds, farmers agreed with me that the ponds are too big and would like to divide them up. However, farmers believe that the optimal pond size is still a relatively large 6-8 ha, an order of magnitude larger than the size I said was probably optimal for efficient feeding and stock management. As in Andhra Pradesh, the ponds have been constructed by trenching around the perimeter to make the dike so it would be difficult to divide the ponds.

Farm-made mixtures of rice bran and oil cakes are used, and inefficiently, as in Andhra Pradesh. In Myanmar the powdered feed consists of rice bran and ground oil cake (groundnut, mustard, sesame or sunflower) at a 9:1 ratio. The farm-made feed is of low quality and feed ingredient availability and supply are insufficient due to high competition for other uses. As described in articles in Aquaculture Asia Volume 12 (3):7-12 and Volume (4):22-26, use of pelleted feed in Myanmar is increasing rapidly and much faster than in Andhra Pradesh, with 17 feed mills currently manufacturing pelleted aquafeeds although farmers are concerned about their cost.

In grow-out ponds rohu are stocked at 5,000/ha or 0.5 m^2, mrigal at 500/ha or 0.05 m^2 and catla at 250/ha or 0.025/ m^2. In the second year rohu can reach 1.6-2.0 kg and catla 3.0-3.3 kg. The cycle is usually single stock and single harvest by seining, with the grow-out ponds drained every 2-3 years.

In Andhra Pradesh the farmers use fertilisers to produce 'green water' which they believe is the major factor in cost-effective fish production. In contrast, fertilisers (mainly inorganic fertilisers, as chicken and cattle manure would have to be transported long distances) are used only for pond preparation. Burmese farmers are unwilling to use fertilisers as: there are insufficient organic manures available; they believe that inorganic fertilisers are expensive and are especially discouraged to use them by the cost required to fertilise their large ponds; the response to fertilization is said to be too slow; and inorganic fertilisers are believed to be dangerous for fish. Furthermore, farmers believe that using only feed is sufficient for fish to grow; this is of course true but at increased cost of production!

I also observed damage to the carp farms caused by Nargis. Upwelling of pond water from the storm surge stirred up the bottom sediments in the ponds and washed out fertile

Seined fish are transported by boat.

water throughout Twante. Pond dikes on many farms were breached with loss of fish although they had been repaired at the time of my visit. Farm equipment, fish feed and farm workers' housing were also washed away and temporary dwellings made from plastic sheets were widespread.

Carp workshop

The workshop was attended by 120 people including 60 rohu farmers. I made a presentation on 'Carp culture in Andhra Pradesh with lessons for Myanmar'. My column on Andhra Pradesh had been previously translated into Burmese and was distributed to participants at the workshop.

I was also formally asked to respond to 15 written questions from Myanmar fish farmers which are summarized: What changes should we make to our fish farming system; should we bring in genetically improved rohu from India or upgrade local fish; what is the protein requirement for rohu fingerlings and as they grow larger does the percentage protein in the feed need to be reduced; what is the ideal fish pond size for semi-intensive culture of rohu; what are the ideal stocking densities for rohu in monoculture and in polyculture with catla, mrigal and grass carp; for best growth of rohu is feeding only sufficient or is fertilization also required; if fertiliser is required, is chemical fertiliser sufficient or is livestock manure also required; which type of feed is best for rohu, pelleted feed or the conventional rice bran: oilcake mixture; is it best to feed pellets to rohu in a basket in the pond or to broadcast them; and what are the main aspects that need to be addressed and implemented during farming, harvesting and processing rohu for competition on the global market? These questions I addressed during my presentation and in a final question and answer session.

The major concerns were on feed and stocking and harvesting strategies. It would appear that high yields of carps are being produced on some farms but that cost of production needs to be lowered. This could possibly be achieved, in addition to cheaper feed and more cost effective feeding strategies through improved stock management strategies to better utilize pond carrying capacity and space or water volume and to reduce the time to produce harvestable fish. In particular, the best strategies to produce fish of export size of 0.7-0.9 kg are being sought.

The participants were also divided into seven working groups, each of which was asked to deliberate one of the following topics: seed quality; stocking strategies; grow-out production

The locally improved strain of rohu.

operations; feed and feeding practices; farm-level harvesting and marketing; domestic and export markets; and government policy and financial matters. The relative importance of these issues was scored by participants and the outcomes of the group discussions were later converted into problem trees.

Fish export

The two groups discussing harvesting and markets raised several important issues. Farmed fish is exported as well as sold on the local market although the domestic fish price is lower than that for export. The domestic price for fish has risen recently as supply as fallen, possibly due to fish exports, indicating that more fish could be produced for the local market.

Myanmar exports about 100,000 tonnes of fish annually, about 30% of the rohu produced and about 10% of striped catfish (*Pangasianodon hypophthalmus*) with a small amount of tilapia. The export size for rohu is mainly 1-2 kg with about 90% being 1 kg fish. The main markets are the Middle East (Kuwait, Iraq, Saudi Arabia and United Arab Emirates) for gutted and chopped fish, mainly for Asian guest workers, and Bangladesh for frozen whole fish. The domestic market demands smaller sized fish, 0.25-0.50 kg, compared to 0.9-1.0 kg for the export market. Myanmar could export considerably more freshwater fish if the main constraint of market glut or shortage is overcome to provide a regular supply of fish for export.

It is important for fish farms to be able to supply the desired sizes of fish in the amounts requested by buyers so that the exporter can bargain for a good price, with increased prices paid to farmers also. Poor infrastructure for transportation of fish from farm to exporter and inadequate market information systems together with a lack of cooperation between producers and exporters hinder their competitive ability. Farmers need to receive requests from exporters for volumes and sizes of fish required at least 2-3 months in advance to give them time to produce the fish. Risks of undersupply or oversupply of fish of improper sizes makes it difficult for exporters to make trading agreements. This often leads to a glut of fish that cannot be exported on the local market, depressing local prices.

Myanmar initially was the only country exporting fish to Bangladesh, mainly rohu, but is now facing increasing competition from India. Myanmar cannot compete well with India, despite only being one and a half days by boat from Chittagong compared to a much longer journey for fish from Andhra Pradesh in India, because of poor marketing infrastructure and the inability to regularly supply large volumes of fish at specified sizes. Another reason is lower quality fish from Myanmar that fetch a low market price, due in part to use of insufficient ice. If exporters were able to get a better price for fish, part of the increased profit would be passed on to the farmers.

Initially striped catfish was mainly raised in monoculture for the export market but now is mainly raised in polyculture with rohu and is mostly consumed domestically; about 30 tonnes are marketed daily. It is difficult for Myanmar to compete at

Striped catfish are often included in the polyculture of Indian major carps.

Nile tilapia are usually grown in monoculture.

Rohu pond destroyed by Nargis in Dedanaw Village.

Aye Aye Mon, one of the four AIT alumni working for Myanmar Egress explaining the purpose of my visit to farmers in Nargis impacted Thee Gone Lay Village.

A fish pond dyke breached by Nargis repaired with earth filled sacs.

A farmer's wife and their children in front of their temporary dwelling in Nargis impacted Dedanaw Village.

One of the 130,000 boats destroyed by Cyclone Nargis.

present with Vietnam to export catfish as the flesh colour is not as good as that of Vietnamese fish so the demand and market price are low. Some is exported to China and Thailand in Asia as well as to Europe and the Middle East. Some catfish has even been exported to Vietnam but only to fulfil orders for re-export.

A Vietnamese government delegation visited Myanmar last year and offered the opinion that Myanmar could not compete with them because of feed. While there is insufficient trash fish to feed catfish in Myanmar, pelleted feed is increasingly being used in both countries. Myanmar has the advantage over Vietnam that it has large amounts of potential arable land that could be used to grow soybean and other possible feedstuffs for inclusion in aquafeeds. Vietnam has well

Above: Temporary plastic sheet dwellings for farm workers. Below: Newly constructed house in Cyclone Nargis impacted Thee Gone Lay Village.

established marketing networks for catfish but Myanmar could become a serious competitor in future if its agricultural sector could be integrated with aquaculture to provide feed.

Production of tilapia has declined relative to last year as it was mainly for export and Myanmar cannot compete with China in exporting the fish. Some tilapia frozen whole is exported to the Middle East and the UK.

The workshop discussion group on policy and financial access raised several issues that need to be addressed for Myanmar to be competitive in exporting fish. There are poor banking facilities with high interest rates. There are insufficient loans from the government as well as insufficient money for investment. The government also levies a high tax of 10% on exported fish. It limits the amount of ice that can be used to be keep fish frozen to an insufficient maximum of 15% which leads to poor flesh quality for the Middle East compared to better quality fish from competitors able to use more ice for 'glazing'.

Small-scale farms

For the purpose of this column, a small-scale farmer is one who operates a family-level, crop-dominated farm, here rice, with small numbers of scavenging pigs and poultry, and is diversifying his/her livelihood through incorporation of a third sub-system, aquaculture.

I visited two areas severely affected by Cyclone Nargis: Dedanaw Village, Kungyan Gone Township, Yangon Division, about three hours drive south of Yangon, where houses had been reconstructed; and Thee Gone Lay Village, Dedaye Township, Ayeyarwady Division, another hour by road and a further 2 hours by boat, where the village school had been reconstructed. By chance, as the visit to the two villages had been arranged to visit the reconstruction of houses and a school, I found that rohu had been farmed in both villages but fish had been washed away by the tidal wave and culture facilities damaged or destroyed.

The farmer and his family that I interviewed in Dedanaw Village were living in a temporary dwelling as their house had been destroyed. The farmer had constructed a 500 m^2 pond in which he had been stocking rohu and feeding them with rice bran. He obtained seed from the major rohu growing area of Twante by travelling on public transport. He used to produce about 300 kg of fish which he sold in the nearby township, generating significant income.

I also interviewed a group of farmers in Thee Gone Lay Village where two farmers had been growing rohu in a rice/fish system. A trench three metres wide and one metre deep had been constructed around their rice fields although I was not able to see the system because the area was flooded. The fish were also fed rice bran and the harvested fish were sold in a nearby township, again indicating that aquaculture is a viable livelihood option for small-scale farmers in the Ayeyarwady delta. The farmers expressed interest in forming a village fish farming group to help other farmers in the village to farm fish but they would need capital to construct fish culture facilities and permission from local authorities to convert some of their rice fields to either trenches or fish ponds. It would be technically feasible to build fish ponds in the village as indicated by the presence of a large existing

Discussion groups at the Rohu Workshop.

Ceremony to celebrate the opening of the new school in Nargis impacted Thee Gone Lay Village.

Writer with farmers in Nargis impacted Thee gone Lay Village foreground village water supply pond background.

pond serving as a communal water supply for the village. Tilapia has been stocked in such ponds throughout Myanmar through a program of the Department of Public Health to control mosquitoes, although the fish are not caught and consumed.

The seminar I gave on small-scale aquaculture options was based on my experience in small-scale aquaculture in general as well as on observations made during the one day trip. The main issue is that there has been no development assistance in aquaculture for the small-scale farming sector in Myanmar because of government concerns about national food security.

As discussed in my previous article on aquaculture in the country, a narrow focus on rice at the expense of fish constrains the attainment of food security. The government supports only relatively large-scale fish farms. Supporting government policy is required to allow the conversion of a portion of farmers' rice fields into fish ponds. Perhaps the integrated rice/fish system developed by two farmers in Thee Gone Lay Village could be promoted on a widespread scale as it may not require a change in government policy. What is clear is however, is that there are several promising technical aquaculture options available for brackish water as well as freshwater and terrestrial agricultural environments that are socially and economically appropriate for the utilisation for the benefit of poor farmers and fishers in Myanmar.

Assistance to areas affected by Cyclone Nargis

My visit to the delta was arranged by Myanmar Egress, a civil society organization with three wings: a capacity development centre; a think tank for policy research and advocacy; and a media unit publishing a newspaper and a business magazine. Myanmar Egress has also formed an NGO; the Nargis Action Group with four Burmese AIT alumni (Tin Maung Thann, Htin Aung Kyaw, Aye Aye Mon and Aye Mya Mya) to provide relief work for Nargis affected areas. The group is currently working with a number of international organizations and NGOs and links up with MFF for aquaculture and fisheries activities. Should you wish to provide assistance to the cyclone victims, I suggest you contact U Tin Maung Thann who, besides being the Vice President of MFF, is also President and Director (Policy) of Myanmar Egress. He may be contacted at tmthann@gmail.com. The need for assistance, especially to Nargis affected areas is acute. Officially the death toll is about 160,000 with about 70,000 missing to give a total of about 230,000. Unofficially the death toll is at least 300,000 persons. If the latter figure even approaches the truth, this would make the death toll greater than the Asian tsunami, further illustrating the need for assistance.

Harvesting, traditional preservation and marketing of fishes of Chalan Beel, Bangladesh

Galib, S.M. and Samad, M.A.

Department of Fisheries, University of Rajshahi, Rajshahi 6205, Bangladesh, e-mail: thegalib@gmail.com

Overview

The legendary Chalan Beel is the largest beel (wetland) situated in the north western region of Bangladesh, with an area of more than 350 km^2 during the rainy season and about 90 km^2 during the dry season. It is one of the most important inland wetlands, creating employment opportunities and providing a huge amount of fish to rural people every year. Chalan Beel is located in area overlapping Atrai of Nawgaon district; Singra, Gurudaspur, Baraigram of Natore district; Chatmohor and Bhangura of Pabna district; and Tarash, Ullapara, and Rayganj of Sinajganj district. Most areas of Chalan Beel are flooded land and consist of numerous small beels and canals. Several rivers and their tributaries form a dense water network over the entire beel area.

Gone fishing...a child baits his hook for fishing in Chalan Beel.