

SEAFDEC/AQD's catfish hatchery specialist at work

By **NJ Dagoon**

SEAFDEC/AQD scientist Dr. Josefa Tan-Fermin started work on the native catfish *Clarias macrocephalus* in the late 1980s. She gathered broodstock in 1988 then developed a simple but effective way of inducing catfish to spawn. In 1989-1990, Dr. Fermin and her team determined the optimum hormone dose and best time to strip the eggs by taking samples of eggs from the ovary of injected fish. They measured the size and monitored the maturation stages of the eggs under the microscope every 3 hours for 24 h in

several runs. Information on the optimum hormone dose and time of stripping of the female is a prerequisite to ensure the success of the artificial propagation program especially of species that do not spawn naturally.

Popular spawning agents in fishes include pituitary glands, human chorionic gonadotropin (HCG), and the luteinizing hormone releasing hormone (LHRH). Pituitary glands are less expensive but dissection of the organs in fish requires skill and practice. Furthermore, it is difficult to quantify the amount of gonadotrophin (GTH, a hormone in the pituitary gland that is mainly responsible for reproduction) because GTH content varies with age, size and stage of maturity of the fish. HCG is expensive and is a large protein molecule. Its prolonged use is reported to develop antibodies in fish. LHRH, a small molecule of about 10 amino acids, induces the pituitary gland to secrete GTH. LHRH however, is sometimes not effective when used



Dr. Josefa Tan-Fermin, SEAFDEC catfish hatchery specialist, examines newly hatched Artemia, catfish larvae food

alone especially in fishes containing high levels of dopamine, which inhibit the release of GTH.

Different workers were using the combination of LHRH with dopamine antagonists such as pimozide or domperidone to spawn various fishes including other *Clarias* species like *C. gariepinus* and *C. batrachus*, following the LinPe method (after the authors Professors Lin of the People's Republic of China and Peter of Canada). So, Dr. Fermin also tried this hormone combination on *C. macrocephalus*. Pimozide cannot be dissolved in the usual solvents used by other workers. Since the suspension of pimozide clogged the needles, Dr. Fermin tried different solvents in which pimozide was completely dissolved. As a consequence, a lower dose of pimozide in combination with LHRH is used in *C. macrocephalus*. Based on the LinPe method also, several companies have developed spawning agents that incorporated gonadotropin hormone releasing hor-

none (has the same action as LHRH) and a dopamine antagonist in one single solution. Dr. Fermin has also tried Ovaprim and Ovatide, products of Syndel Pharmaceuticals in Canada and Hemmo Pharma in India, respectively.

Aside from her work on catfish, Dr. Fermin was then pursuing sex change research on grouper. She applied for doctoral studies at the Faculty of Fisheries, Hokkaido University in Japan in the laboratory of Prof. Kohei Yamauchi who advised her to concentrate on cat-

fish for dissertation. The laboratory of Prof. Yamauchi specializes on reproductive physiology and endocrinology of freshwater fishes. Home adviser Dr. Clarissa Marte, SEAFDEC/AQD research head, further advised Dr. Fermin to focus on the later stages of maturation, which is the constraint in the propagation of *C. macrocephalus*.

In the early 1990s, several projects, including "Broodstock development and seed production of *C. macrocephalus*," got funding from the Fisheries Sector Program (FSP) of the Department of Agriculture-Bureau of Agricultural Research (DABAR). Other researchers in the Research Division got involved in the implementation of the project. Dr. Luis Ma. Garcia tried hormones and pheromones on catfish breeders to induce the spontaneous release of eggs and milt (a hydrated suspension of sperm). Dr. Fermin tested several methods that can improve the hatching efficiency of the catfish eggs. Mr. Armando

Fermin did refinement of hatchery and nursery techniques to mass produce the fry. In addition, Dr. Corazon Santiago's study on the development of broodstock diet for *C. macrocephalus* was also funded by FSP.

Dr. Fermin's dissertation showed that there is a best time to induce the breeding of catfish. Although catfish can be induced to spawn whole year round, reproductive and larval performances are relatively inferior when spawning runs are carried out during the months of January to March in the Philippines.

One of the main constraints in the artificial propagation of *C. macrocephalus* is the practice of sacrificing males to obtain the milt in fertilizing eggs. Dr. Fermin tried to solve this problem by testing several hormonal treatments that will induce the milt release of male catfish. As in the results of the FSP-funded study of Dr. Garcia, spontaneous or manual release of milt was not observed. In previous reports, catfish milt was usually suspended in saline solution, and one male was sacrificed to fertilize the eggs from one female. Although Dr. Fermin found out that sacrificing catfish males was inevitable, she saw an efficient way of maximizing the use of milt. By dilution of and adding a lower saline concentration to the milt, one male is enough to fertilize the eggs from 3-4 females.

In 1998, Dr. Fermin tried putting all the best results of her experiments into one study to verify the breeding and hatchery protocol developed at AQD for catfish that can be widely adopted by the private industry. When Mr. Fermin started to work on abalone and later became the project leader, there

SEAFDEC/AQD's induced maturation and breeding protocol



Acclimation

Catfish broodstock can feed on formulated diet of 36% protein. During induced spawning runs, sexually mature male and female fish are taken in the morning from broodstock tanks and stocked separately in smaller tanks. The body weights of each female fish are recorded prior to stocking.

Hormone preparation

Different hormones such as luteinizing hormone releasing hormone analogue (LHRHa) + pimozide (PIM), human chorionic gonadotropin (hCG), pituitary gland extract (PG), Ovaprim (Syndel Pharmaceuticals, Canada), Ovotide (Hemmo Pharma, India) etc. are used to spawn the female catfish. Hormones are prepared just before females are injected, and the remaining solution is kept in a sealed vial inside the refrigerator.

Injection

Gravid females are injected with any of the hormones in the afternoon, between 2 to 5 PM. Hormones are injected into the dorsal musculature of the fish.

Artificial fertilization

The next morning, about 16 to 20 hours after hormone injection, ovulated eggs are manually stripped from the females by squeezing the lower abdomen. Just before females are stripped of eggs, male catfish are sacrificed to get the reproductive tract that is then macerated and crushed to obtain milt, the hydrated suspension of sperm. Catfish milt is suspended in saline solution and the milt-saline mixture is poured into the basin that holds the stripped eggs also. Milt from one male can fertilize eggs from three females that are of the same body weight. Ovulated eggs are mixed with the diluted milt with a dry feather for about 1-2 minutes. Few drops of water from the faucet are added to the egg-milt, with continuous stirring. The fertilized egg mass is then transferred to a small scoop net, washed gently with



SEAFDEC work ... from p 19

was a need for someone to continue working on the nursery stage. The Fermin couple identified Ms. Ruby Bombeo of the Nursery Section to take over. As Catfish Project Leader, Dr. Fermin further invited Mr. Eliseo Coniza and Ms. Mae Catacutan to join the team. Mr. Coniza just finished his Master of Aquaculture degree from the University of the Philippines in the Visayas. Ms. Catacutan of the Feed Development Section formulated the feeds for weaning, nursery and grow-out. Several people from the private sector bought catfish fry and fingerlings as research by-products from the studies of Ms. Bombeo and Mr. Coniza. The following year, a catfish hatchery production unit was created to provide the seeds to private entrepreneurs who would try the culture of the native catfish. With the help of Engr. Zaldy Suriaga of AQD's Engineering Section, a recirculating system especially during incubation of the eggs was put up. While broodstock may withstand polluted water, eggs need clean, pure, flowing water during incubation.

A typical production run at the AQD hatchery shows that fifty 150-200 g females can produce around 150,000 5-day old larvae with a survival rate of 30-70%. The AQD hatchery sells two week-old fry at P0.50 per piece, while the price of

fingerlings range from P1.00 to P2.50 depending on the size.

When word began to spread that AQD can provide the seeds of the native catfish, many in the private sector were enthusiastic. "Imagine the process of research," Dr. Fermin observed, "it took 10 years and it is only now that it peak up."

This interest may be due to the locals' desire to bring the native catfish back to their tables. Due to a still unidentified cause, the catfish has apparently long disappeared in natural waters. Many Filipinos want it back, because they claim that the meat of *C. macrocephalus* is more tender and delicious than that of the African catfish *C. gariepinus* and the other Asian catfish *C. batrachus*. Some of the Freshwater Aquaculture Training participants from Thailand also attest to the higher prices *C. macrocephalus* command in their homeland.

AQD now receives orders twice or thrice a week for catfish fry or fingerlings from private hatcheries, fishery schools and local governments. Provincial governments are enthusiastic about restocking inland freshwater waterways with the AQD hatchery-produced fry.

AQD is collaborating with the Office of the Governor of Iloilo for the restocking program. The Catfish Project researchers and staff conducted a free lecture and hands on training on breeding, hatchery and nursery operations of the native catfish for 2

weeks in September 1999. Moreover, AQD also has a tie up with DA-BFAR to accelerate the techno-transfer of mature technologies developed, which includes catfish. This program aims to increase fish production and revenues from the aquaculture sector, and provide alternative livelihood to fisherfolks.

When asked what concerned her the most regarding the industry, Dr. Fermin remarked of hopes for the industry to pick up the catfish technology, which aside from being mature and feasible, requires less capital than the other carnivorous aquaculture species. "It is easy and can be done in one's own backyard," she pointed out.

Dr. Fermin envisions many forthcoming catfish studies. She plans to do an economics study of the catfish hatchery, as well as determine the cause of disappearance of the native catfish in the Philippines. Genetic characterization has to be done in collaboration with Dr. Zubaida Basiao of AQD's Binangonan Freshwater Station, and simultaneously, develop tagging techniques to mark the release of hatchery-bred fingerlings in natural habitats.

Her final words: "I just hope that the private sector would bear with us for a little while, because research that is tested and proven takes time to perfect. It is different when one's studies have sound scientific bases because one can be confident and sure that it will work. And this is so with the native catfish." ###

Iloilo market ... from p 27

both in Zarraga and in the gourmet restaurants of Iloilo City. This high price added to the interest in growing the fish even though it is slower growing than the *batrachus* and the *gariepinus*. The hatchery technique perfected by AQD scientists and promoted by government technicians will also stabilize the supply of seed stocks.

The provincial government is actively promoting the fish as a source of high qual-

ity and affordable protein. It has published a brochure distributed throughout the province, urging the people to grow the fish for added income from rice farm. The brochure is part of a series promoting rice-based integrated farming as a means to increase the productivity of rice farms. The Provincial Governor, Honorable Arthur Defensor, also created the Technology and Livelihood Development Center to spearhead

the access of technologies including fisheries technologies and transfer them to farmers and entrepreneurs in the Province.

REFERENCES

- Pet Milleza, "Zarraga farmers hold catfish festival," Capitol News Release, April 21, 1998
- Provincial Agriculture Office. 1997 Annual Report