SEAFDEC
Asian Aquaculture

Volume XXV Number 4 October-December 2003 ISSN 0115-4974

Catfish Aquaculture

by

Josef[illegible]D. Tan-Fermin, PhD

SEAFDEC Aquaculture Department
5021 Tigbauan, Iloilo, Philippines
e-mail: jtfermin@aqd.seafdec.org.ph

The Philip[illegible]es is the fourth biggest catfish-producing country in Southeast Asia in 1997 to 2001. Next to tilapia, catfish is the second highest freshwater fish produced in fishponds in 2001. In Asia and the Pacific, highest production comes from *Clarias* spp. of the family Clariidae. Of great importance in fisheries and aquaculture and the most well-studied species among the clariids are the Asian catfish *Clarias macrocephalus* and *C. batrachus*, and the African catfish *C. gariepinus* (*C. lazera*).

Because of its tender and delicious meat, the native catfish or 'hito' or *C. macrocephalus* (picture this page) is one of the favorite freshwater food fishes in the Philippines. Before the early seventies, it is abundantly found in the rice fields and other natural habitats in the Philippines. At present however, *C. macrocephalus* is scarcely found in rice fields or any of its natural environment. Some observers hypothesized that the fast disappearance of *C. macrocephalus* is due to its interbreeding with *C. batrachus*, a closely related, faster-growing species introduced from Thailand in the 1970's. In Thailand, there is almost the same number of *C. macrocephalus* and *C. batrachus*, while in Vietnam, there is a more abundant supply of *C. macrocephalus* than *C. batrachus.*

C. macrocephalus and *C. batrachus* are almost similar in size and appearance. *C. macrocephalus* can be distinguished from the Thai catfish *C. batrachus* by the shape of the occipital process, blunt or rounded in the former

☞ page 2

Getting IRAP started in Vietnam

Excerpted from the travel report of WG Yap and VT Sulit. For more information, email: wgyap@aqd.seafdec.org.ph

The importance given by Vietnam to SEAFDEC's integrated regional aquaculture program (IRAP) was evident in the fact that two ranking officials of the Ministry of Fisheries flew to Hue from Hanoi to meet the IRAP staff from SEAFDEC/AQD (Mr. Wilfredo Yap, Ms. Virgilia Sulit, and Ms. Marietta Duray). The two were Dr. Vu Van Trieu, Director General. International Cooperation Department: and Dr. Tran Van Quynh, Director. National Fisheries Extension Center. With them was Tran Van Chuong, Vice Director. Fishery Promotion Center of Hue province.

At the Hue provincial fishery office, the AQD staff was briefed on the itinerary (July 29 to August 4, 2003) and the Vietnamese counterparts' expectations of IRAP. Afterwards, the group went to Phu Tuan commune to visit a prawn hatchery, which is intended to be converted into a rabbitfish hatchery. A private nursery, which uses rabbitfish fry caught from the Pha Tam Giang, was also visited.

☞ page 10

2004 training courses at SEAFDEC/AQD, page 19

European Union and SEAFDEC/AQD on mudcrab *Scylla* p 20

Wanna know what concerns fishfarmers? Share in their frequently asked questions, **p 11**

Catfish feeding experiment. p 4

Part 2 of 2 of *Business opportunities in aquaculture* will appear next issue. Our apologies.

www.seafdec.org.ph

A publication of the Aquaculture Department of the Southeast Asian Fisheries Development Center [SEAFDEC/AQD] Tigbauan 5021, Iloilo, Philippines

CATFISH AQUACULTURE ... FROM PAGE 1

To spawn the native catfish, a choice of hormones can be injected to female catfish while the male catfish is sacrificed for its milt

and pointed in the latter, and presence of white spots along the sides of the body in *C. macrocephalus.*

SEAFDEC Aquaculture Department at Tigbauan. Iloilo, central Philippines, embarked on research on the artificial propagation of *C. macrocephalus* since the late 1980s to provide the seeds and probably restock natural population. This article will deal with the biology, broodstock management, seed production techniques and grow-out culture practices in *C. macrocephalus.*

Biology and broodstock management

In the Philippines, catfish can be found in Bicol region, Palawan, and some areas in Mindanao. These can be collected from lakes, rivers, tributaries by hand or indigenous fish trap. After collection, the fish can be transported in any container made of styrofoam. plastic, metal and the like, with pond or riverine water just enough to cover the bodies of the fish, without aeration.

Broodfish can be reared in concrete tanks with 10 cm mud overlay or in earthen ponds. Before stocking the fish, 1.0-1.5 ton per ha agricultural or 0.5-1.0 ton per ha hydrated lime is applied to disinfect and eradicate predators, while 50-100 ppm formalin is used to prevent the growth of filamentous algae.

In the wild, catfish fry feed on small crustaceans, protozoans, and phytoplankton, and on worms, insects, crustaceans, and benthic organisms as they grow bigger. Catfish are carnivores, but can feed on kitchen refuse, fish meal with broken rice or rice bran, or formulated feeds. SEAFDEC-formulated broodstock diet containing 439c protein resulted in comparable reproductive and larval performance as when the fish were fed fish by-catch or trash fish. The composition (% dry weight) of this diet is as follows: fish meal, 15; soybean mean. 35: ricebran, 15.61; corn starch. 2: vitamin mix. 3.55; soybean oil. 3: meat and bone meal. 22.4: and copra meal. 3.44.

Sexes can be distinguished externally by the presence of elongated, urogenital papillae in the males, and a round opening in the females at the lower, ventral side of the body. Regardless of size. *C. macrocephalus* are generally mature at 6 - 8 months of age.

The natural breeding months in catfish vary from place to place. However, the common factor in these places is the onset of the rainy season. The final stimulus to spawn in Clariid catfishes seems to be associated with a rise in water level and flooding of marginal areas.

Breeding

While natural spawning of catfish occurs in the wild. *C. macrocephalus* may not spawn in confined waters: hence, use of hormones to induce its spawning is necessary. The absence of spawning is correlated with the lack of a surge in gonadotropin (GTH), a hormone secreted by the pituitary gland with gonad (ovary or testis) as target organ. Most of the hormonal treatments either stimulate or artificially induce the endogenous release of GTH.

For induced spawning, it is better to choose bigger females since fecundity is positively correlated with size. Success in induced spawning depends largely on knowledge of the optimum dose of the hormones to be used and the resulting latency period, the time between hormone administration and stripping of eggs. The optimum dose and latency period using the different hormones is summarized below:

Inject females with	strip after
pituitary gland (1 per 100 g body weight. BW)	13-14 hours
hCG or human chorionic gonadotropin (4 IUs or international units per g BW)	13-18 h
LHRH or luteinizing hormone-releasing hormone (0.05 μg) + 1 μg of PIM per g BW	16-20 h
Ovaprim (0.05 μl per g BW)	16-20 h
Ovatide (0.20-0.50 μl per g BW)	16-20 h

About 16-20 hours after hormone injection, females are checked of their readiness to release eggs. If eggs ooze out upon gentle pressure on the abdomen, male catfish are then sacrificed, the reproductive tract dissected and macerated to obtain the milt, a hydrated suspension of sperm. Male catfish are sacrificed because milt cannot be stripped from the abdomen. Milt is mixed with 0.6% sodium chloride (NaCl), placed in a small beaker, and poured into same container where eggs are stripped. Eggs and milt are then mixed with a feather for about one minute, transferred to a small scoop net and wash in gentle, running, tap water before fertilized egg mass is transferred to the incubation container. Speed is important in doing these procedures since sperm are motile for a few minutes only, and stripped eggs are viable for about 1-2 minutes due to closure of the micropyle. (Sperm enter the egg through an opening on the egg surface called micropyle.)

Catfish possess demersal, spherical or slightly oval-shaped eggs that measure 1.2-1.6 mm, and become sticky upon contact with water.

Hatchery

Simple facilities are used in running a catfish hatchery. Basically, facilities include incubation containers where fertilized egg mass are hatched and yolksac larvae maintained, and tanks for rearing the larvae for about two weeks.

An incubation container can be in the form of a rectangular, wooden trough or plastic basin, but should have a flow-through water supply during incubation and until hatching of the larvae, which is about 24 - 30 h at water temperature of 26 - 30°C. Eggs can be stocked at 4000 per liter, and are usually spread as a monolayer on a rectangular screen net on a wooden frame. Good water exchange is necessary, hence having a recirculating water system using rain water during incubation of catfish eggs is advisable. The newly hatched larvae are easily dropped into the bottom of the trough by slowly moving the framed screen net, leaving only the dead eggs on it.

The newly hatched catfish larvae contain yolk, which serve as food. It takes about 4-5 days for the yolk to be totally resorbed. Thereafter, natural food organisms such as newly hatched nauplii of the brine shrimp *Artemia* are given to the larvae for 3 days, and the cladoceran *Moina* for another 4 days. Thereafter, catfish larvae are fed artificial feed containing 40% protein with particle size of 150-200µ in three rations daily at 50% of the body weight. The composition (% dry weight) of the SEAFDEC diet: soybean meal, 25; Peruvian fish meal, 35; rice bran, 19.5; bread flour, 10; cod liver oil, 3; soybean oil, 3; vitamin mix, 3; and mineral mix, 1.5.

Nursery

Bigger rearing facilities are needed for the production of catfish fingerlings in the nursery. Ten days before stocking, growth of natural food organisms should be promoted by suspending about 20 kg cow dung placed in a sack in the middle of the tank or pond and introducing *Moina* or *Daphnia* starters. Although the 15-day old fry or even the 3-day old first feeding larvae can be stocked directly into the tank or pond, it is advisable to rear the larvae inside a net cage with a mesh size of 0.5-1.0 mm, especially if fry are reared in ponds. Rearing in net cages suspended in either tanks or ponds was observed to improve survival of the fry.

The same formulated feed given to the fry in the hatchery phase can be fed during the nursery phase. Feeding is given in three rations daily at 20% BW during the first week, 15% BW on the second week, and 10% thereafter.

As in the hatchery, rearing of the fry to the fingerling stage in the nursery is also done in a static water system. Water change can be done weekly. In tanks, 50% of the rearing water is replenished, while replenishment of water in the ponds is done when necessary to maintain a depth of 70 cm.

Fifteen-day old *C. macrocephalus* fry can be stocked initially at 200-800 per square meter in tanks, and up to 1200 per m^2 in net cages that are suspended in ponds or tanks. After 28 days of rearing, fry grown in tanks can reach the size of 0.2-0.4 g and 3-4 cm, and 0.4-1.4 g, 4-5 cm when reared under pond conditions.

Grow-out

Catfish are usually cultured in earthen ponds or pens, either in monoculture or polyculture with other fishes, especially tilapia.

Preparation of ponds include drying the pond bottom for 7-10 days until the soil cracks, and application of hydrated lime and chicken manure at 1 ton per ha. Before stocking of the fish, 60% of the rearing water is changed, and increased to a depth of 60 cm upon stocking of juvenile catfish. Uniform-sized and healthy fingerlings are selected for stocking. Swamp cabbage and water hyacinth are grown at 20-30% of the pond area to serve as shelter for the fish.

When used for intensive culture, catfish juveniles are fed with artificial feeds containing at least 40% crude protein. However, commercial pellets with 30-32% crude protein or a combination of blanched chicken entrails and rice bran at a ratio of 9:1 are acceptable to catfish when given as supplemental feed. As catfish grow bigger, decreasing feeding rates of 5 to 3% of the body weight is recommended.

Stocking density for grow-out culture depends on the initial size of the fingerlings. Catfish juveniles, with mean total length of 3-4 cm can be stocked at 80-100 ind per m^2, 5-6 cm at 60-80 ind per m^2, or 7-10 cm at 40-60 ind per m^2. With proper management, culture of *C. macrocephalus* takes about 4 - 5 months.

Diseases caused by bacteria or ectoparasites can affect the culture of catfish. Lime and salt at 1 kg per $40m^2$ are applied two weeks before the cold season, and at 0.5 kg per $40m^2$ every two weeks. Diseased fish should be isolated from the rest of the stock and disposed of properly.

Economic analyses

Investment costs per run for broodstock and hatchery, nursery and grow-out operations in catfish is about P142 700, P83 000, and P178 500, respectively (below).

Summary of financial investment analysis of catfish seed production and grow-out operations for 10 years

	Hatchery	*Nursery*	*Grow-out*
Gross revenue	P 8,432,167	11,222,833	23,184,500
Investment costs	142,700	83.000	178,500
Total cost	3,156,744	6.202,838	13,981,901
Net income	5,132,722	4,936,995	9,024,099
Payback period (yr)	0.25	0.15	0.19
Net present value at 12%	2,530,192	2,456,970	4,467.056
Internal rate of return (%)	387	666	526

####