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Research on catfish... at the SEAFDEC Aquaculture Department

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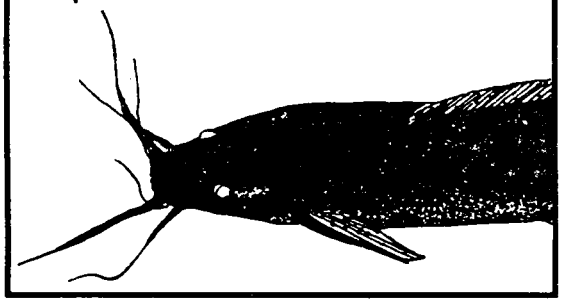
Induced spawning of the native catfish

Pituitary extracts, human chorionic gonadotropin (hCG), corticosteroids or luteinizing hormone-releasing hormone analogues (LHRHa) have been used to induce spawning of the captive native catfish *Clarias macrocephalus*. These spawning agents are either difficult to quantify (pituitary extracts), expensive (hCG), or ineffective (corticosteroids or LHRHa alone). To find a cheaper yet more effective substitute, LHRHa at varying doses (0.025, 0.05, 0.10 µg per gram body weight) in combination with pimozide (1 µg per gram body weight), a dopamine antagonist, were tested on catfish.

Native catfish were collected from rivers in Iloilo and then stocked in 9.5 x 1.5 x 1 meter concrete tanks with a mud bottom. The fish were maintained under natural light cycle and fed trash fish daily at 5% of their body weight. A day before the experiment, 23 gravid females averaging 110 grams were anesthetized and placed separately in 60-liter fiberglass tanks with water at 30-31°C. Fifteen male catfish were also placed in a one-ton tank. One hour before females were stripped of eggs, the males were killed to remove the testes. Catfish milt could not be obtained by simply pressing the abdomen.

The native catfish *Clarias macrocephalus* must be bred artificially and restocked in the natural waters to prevent its permanent loss.



LHRHa was dissolved in 0.9% sodium chloride, pimozide in dimethylsulfoxide, and propylene glycol was added at 1:9 by volume. The hormone preparations were freshly prepared and injected into all females simultaneously at 1800-1900 H on both sides of the back.

Egg diameter was determined before treatment. The eggs were obtained from the ovary by aspirating with a silastic medical grade tubing. At least 20 eggs from each fish were fixed in 1% phosphate-buffered formalin and measured within 120 hours after fixation. The fish were at the same initial stage of ovarian development.

Females were stripped at 12, 16, 20, 24, 36 and 48 hours after injection. Stripped eggs were placed on a petri dish and weighed. The eggs were then fertilized with milt from macerated testes.

All fishes injected with pimozide + 0.05 or 0.10 µg LHRHa per gram body weight ovulated in 16-20 hours. Only 1 of 5 fish injected a lower dose ovulated in 16 hours, and none did of those injected the solution without hormone. Ovulation seldom occurred 24 hours after injection. Egg production and fertilization rate were not significantly different, but hatching rate was higher among fish treated with pimozide + 0.05 µg LHRHa.

Thus, the following protocol is recommended for native catfish: simultaneous injection of 0.05 µg LHRHa and 1 µg pimozide per gram body weight into females, stripping of eggs 16-20 hours later, and dry fertilization of eggs with milt from sacrificed males. Induced spawning of the native catfish and hatchery production of fry can provide seeds for commercial culture and restocking of natural waters.

Source: JD Tan-Fermin and AC Emata. 1993. *Induced spawning by LHRHa and pimozide in the Asian catfish Clarias macrocephalus (Gunther).* **Journal of Applied Ichthyology** 9: 89-96.

Feeding of fry in nursery

To revive the once widespread culture of *C. macrocephalus* and to ensure a sufficient supply of fry and fingerlings for stocking, SEAFDEC/AQD conducted feeding studies in the nursery. *Clarias macrocephalus* fry were fed live zooplankton (*Artemia* or *Moina macrocopa*) with or without dry diet. Survival was generally high, ranging from 71% to 86%, except among the fish fed the dry diet alone. The specific growth rate over a 14-day rearing period was higher among fish fed *Artemia* plus a dry diet than among those fed either live zooplankton or the dry diet alone. In fact, *C. macrocephalus* larvae can directly take dry diet after yolk resorption. However, continued feeding on the dry diet resulted in poor growth and survival. Moreover, mortality due to cannibalism among these fish increased from 4 to 18%. Cannibalism (1.5%) was much lower among fry fed an artificial diet after feeding on *Artemia* for 7 days.

Source: AC Fermin and Ma EC Bolivar. 1991. *Larval rearing of the Philippine freshwater catfish, Clarias macrocephalus (Gunther), fed live zooplankton and artificial diet: A Preliminary Study.* **The Israeli Journal of Aquaculture-Bamidgeh** 43(3): 87-94.

Ongoing research on catfish

Several other studies on catfish are now ongoing at AQD. The results obtained in 1992-1993 are given below. These results are unpublished and must not be cited without the authors' permission.

Native catfish under captive conditions do not ovulate without hormone injection and do not spawn spontaneously. The females have to be stripped of the eggs and the males sacrificed to get the milt. Methods to make the native catfish spawn spontaneously are being tested by Luis Garcia. Male and female catfish were given a single intramuscular injection of 0.05 µg LHRHa + 1 µg pimozide per gram body weight. Sixteen hours later, they were dipped for two hours in a shallow basin containing 1 µM of either etiocholan-3α-ol-17-one glucuronide, 11ß-hydroxyetiocholanolone glucuronide, or their combination. These chemicals may act as pheromones that attract ovulating females. The fish were then returned to a larger tank. No spontaneous release of ovulated eggs nor hydrated milt was observed in any of the pairs up to 30 hours after injection.

The recommended dose combination of LHRHa and PIM was tested by Josefa Tan-Fermin to induce captive catfish to spawn at different times: before (April-May), at the peak (June-September), at the end (October-December) of the breeding season, and during the off-season (January-March). With a combined dose of 0.05 µg LHRHa and 1 µg pimozide per gram catfish, ovulation rate was 100% when fish were injected before and at the peak of the season, but decreased to 80% at the end, and to 60% during the off-season. In contrast, ovulation was never observed in fish given no hormones, LHRHa alone, or pimozide alone.

The optimum milt-to-egg ratio to use in artificial fertilization of the native catfish was determined by Victoria Tambasen-Cheong using the commercial hormone preparation, Ovaprim (a combination of salmon gonadotropin-releasing hormone and domperidone) injected at 2 µl per gram fish. Fertilization and hatching rates were significantly affected by milt volume, but not by the amount of eggs. Fertilization and hatching rates were consistently high when 2.5-10 grams of stripped eggs were inseminated with 25-50 µl milt. Thus the optimum ratio was 25-50 µl milt to 10 grams eggs, or about 4,000-8,000 sperm per egg. Survival of larvae was 60-70% at all milt volumes and egg quantities tested.

Improvement of the hatching efficiency of artificially spawned eggs of native catfish is being sought by Josefa Tan-Fermin. First, the stocking density to use in further experiments was established. In static hatching containers, dissolved ammonia levels were higher when eggs were stocked at 200-800 eggs than at 100 eggs per liter, but pH, nitrite, total hardness, and total alkalinity were not different. All eggs died when incubated at 800 per liter. Then, several ways were tested to remove the adhesive coat of catfish eggs and improve hatching. Fertilized eggs were washed with either: tap water, a salt solution (4 grams NaCl per liter), tannin (0.6 grams per liter), a salt-tannin combination, or a salt solution with 3 or 20 grams urea per liter followed by tannin. In two trials, hatching rates

were 22% in salt solution, 17% in tannin, 23% in salt and tannin, and 10-12% in tap water and other treatments.

The hatchery and nursery techniques for native catfish are being refined by Armando Fermin. Fry (1.6 cm, 30.6 mg) were fed formulated dry diets at 0, 10, 20, 30, or 40% of body weight. After 35 days of feeding, lengths (2.6-2.9 cm) and survival (45-71%) of juveniles were not different among treatments. Starved fry all died within 16 days.

Practical diets for native catfish broodstock are being developed and evaluated by Corazon Santiago. A 21-week feeding trial with wild juveniles showed poor growth and high mortality on four practical diets. A separate feeding trial was then done on hatchery-reared juveniles (8 grams). Control catfish were fed a combination of frozen fish and commercial pellets; four other groups were fed four practical diets with different sources of protein. All four diets contained fish meal, soybean meal, and meat and bone meal at different levels; one diet also contained copra meal, and another diet had ipil-ipil leaf meal. After 36 weeks, all catfish were relatively small (15-23 grams) but some had already matured; fully 50% of those fed the diet with copra meal but only 12% were of those fed the diet with ipil-ipil leaf meal.

The ecological impact of the introduced African catfish is being studied by Alejandro Santiago. First, the predatory habits of the fish were observed in aquaria. Mixed sizes of tilapia, tiger perch (*ayungin*) and gobies (*bulig* and *dulong*) were provided. The African catfish consumed about five tilapia, or five gobies, but one *ayungin* per day. Fish less than 4 cm long were preferentially taken. Culture of the African catfish is now regulated by the Bureau of Fisheries and Aquatic Resources.

... at the African Regional Aquaculture Centre

A paper by AA Adeyemo, GA Oladosu and AO Ayinla of the African Regional Aquaculture Centre (accepted June 1993 for publication in **Aquaculture**) showed the potential of *Moina dubia* as first feed for the African catfishes *Heterobranchus bidorsalis*, *Clarias gariepinus* and "Heteroclarias" (hybrid of *H. bidorsalis* male and *C. gariepinus* female).

The use of zooplankton as a first feed source for rearing larvae or fry of hatchery fish has been widely studied. Most studies have shown that the fry grow better when fed with live zooplankton than with dry artificial diets.

Laboratory-cultured *Moina dubia*, mixed zooplankton (harvested from earthen pond), *Artemia* nauplii, and a commercial dry diet (54.2% crude protein) were tested as first feed for the fry of selected African catfish species. Concentrated volumes of the live food were fed daily and the commercial diet was given *ad libitum*.

After a 7-day nursery period, the best growth and survival were observed among fry fed *Moina*. Mortality was similar among fry fed the live food diets and somewhat higher among those given the commercial diet.

The better growth of African catfishes fed cultured *Moina* is likely due to the preference of the catfish fry for *Moina* rather than to any nutritional deficiency in the other zooplankton in the diet.

The use of cultured *Moina* is considered a convenient alternative to *Artemia* and dry feeds. *Moina* was cultured as follows: Phytoplankton medium was prepared to contain potassium nitrate (0.132 grams), sodium monophosphate, sodium silicate and ethylenediaminetetraacetic acid (EDTA) (at 66 mg each) in 10 liters of brackish water (salinity 18-22 ppt) from a nearby creek. The medium is exposed to daylight for 3 days to generate a phytoplankton (mostly diatoms) bloom. It was then diluted with filtered freshwater to a salinity of 2 ppm and equally divided into two aquaria, and aerated. The aquaria were then inoculated with 4 individuals of *Moina* collected from earthen ponds.

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