COMMERCIAL PRODUCTION OF *Clarias* FRY AND FINGERLINGS IN INDOOR AND OUTDOOR CONCRETE TANK SYSTEMS

by

C.T. MADU, F.C. OKOYE and E.O. ITA

Kainji Lake Research Institute
P.M.B. 6006, New Bussa
Nigeria

ABSTRACT

Induced breeding technique by hypophysation is being applied at the Kainji Lake Research Institute Fisheries Division Hatchery complex for the production of *Clarias* fry and fingerlings in indoor and outdoor concrete tank systems. The hatchlings are fed on livefood (zooplankton) and artificial feed. Source of zooplankton is from cultured stock which is maintained throughout the breeding season by fertilization.

Production values show that an average of over 4,000 hatchlings (larvae) can be produced by a female breeder (over-700g wt) and percentage survival after two months ranges between 70 to 75%. With the proposed modification and expansion project, an estimated production of over 0.5 million fingerlings per breeding season is projected.

INTRODUCTION

Reliable and consistent source of fingerlings (fish seeds) especially for the commercially important species is a pre-requisite for successful fish farming. *Clarias* spp (the mudfishes) are highly esteemed group of fishes in Nigeria and command very high commercial values in our markets but unfortunately, the source of their fingerlings poses a major problem to fish farmers. The mudfishes do not reproduce readily in captivity and when they breed in the wild, the survival of the offsprings (hatchlings) is extremely very low due to climatic and biological hazards associated with the wild. Various management techniques such as environmental and hormone-induced breeding in tanks, cages and ponds, artificial propagation (or stripping technique) have therefore been developed for the mass production of *Clarias* fry and fingerlings under controlled conditions (De Kimpe and Micha, 1974; Huisman *et al*, 1976; Keller and Vincke, 1976; Hogendoorn, 1979; Adigun *et al*, 1983; Hogendoorn, 1983; Madu *et al*, 1984; Viveen *et al*, undated).

In this paper, controlled mass production of *Clarias* fry and fingerlings using indoor and outdoor concrete tanks will be discussed. A proposal for modifying and expanding the existing set-up will also be highlighted as a positive step towards maximising production.

MATERIALS AND METHODS

The Clarias fry and fingerling production exercise takes place in the Kainji Lake Research Institute Fish Hatchery Complex, New Bussa. The complex is made up of an indoor and outdoor hatchery management systems.

(a) The Indoor Hatchery

The indoor hatchery consists of two sets of six concrete tanks (3 x 2 x 1 m) and 2 x 2 x 1 m - length x width x depth) enclosed in a building (Figure 1).

At one end of the building are two rooms, a store and an office/laboratory while the other end is open for indoor experiments with aquaria, fibre glass tanks, wooden and plastic tanks and other movable equipment. The two sets of concrete tanks are centrally located giving enough allowances for the free movement of workers. Each tank has provisions for water inlet and drainage. Proper illumination and ventilation are ensured by a generous supply of fluorescent light and ceiling fans. Also, the long sides of the house are not walled to the roof but to about three quarters, the rest being completed with mosquito wire mesh. Water supply to the indoor hatchery is from a perennial water reservoir, the Kigera III reservoir 50m away. The water is first pumped up into four overhead tanks of about 1,000 gallons (about 4,500 litres) each and located just beside the hatchery. From there, the water is then distributed through a network of pipes into the indoor concrete tanks. The indoor hatchery is used mainly for induced breeding and nursery of hatchlings up to one month old.

(b) The Outdoor Hatchery

As the name suggests, the outdoor hatchery is located outdoors and consists of two sets of concrete tanks/ponds, 6 x 6 x 1.3m and 5 x 4 x 1.3m in size. Only five of the later have been completed and are presently in use. Water is supplied by pumping through pipes connected from Kigera III reservoir. The outdoor tanks are used mainly for livefood culture and rearing of hatchlings/fry after one month old.

(c) Breeding and Fry Rearing Exercises

Induced breeding by hypophysation technique is presently being applied. Mature breeders are usually collected from the Institute's pond reservoir and from broodstock earthen ponds specifically reserved for Clarias spp. The breeders are then transferred to the indoor hatchery where they are classified into species, sexed and tested for ripeness. A female is selected as ripe if it shows a rounded abdomen and the release of eggs when pressed slightly on the abdomen. Ripe males are agile and reddish at the tip of their genital papillae.

(i) Hypophysation: Only breeders of the same species are paired for induced breeding and the three major species of Clarias in Nigeria (i.e. Clarias gariepinus, C. anguillaris and C. submarginatus - White, 1965; Mill, 1966; Reed et al, 1967) can be identified using their vomerine teeth. Ripe males and females are matched closely by weight and the females injected intraperitoneally with dry carp pituitary at a dose of 4mg/kg of body weight or with a mixture of dry carp pituitary and fresh Clarias pituitary. The males receive half the female dose. Gravid females are usually sacrificed for fresh pituitary.

Injected males and females are introduced into prepared spawning tanks (laid with gravels and/or spawning mats made from jute bags) at a male to female sex ratio of either one to one or preferrably 2 : 1, and the water levels in the tanks gradually increased through the night. The tanks are also usually aerated using aerators and diffusers.

Spawning takes place in the night (under 24 hours) and the eggs hatch 2-3 days later depending on the water temperature. At 30 - 32°C hatching takes place within 2 days. The hatchlings are later distributed to various tanks for ease of feeding.

(ii) Fry rearing (nursery operations): Clarias (mudfish) hatchlings feed exclusively on livefood (zooplankton) within the first 12 - 15 days of life. A steady source of zooplankton must therefore, be ensured before any induced spawning exercise could be embarked upon. Zooplankton is cultured in the outdoor concrete tanks. About two weeks before the initiation of induced breeding exercises, the tanks are half filled with water and fertilized with organic (fermented chicken manure) and inorganic (superphosphate + Urea or NPK 15.15.15) fertilizers. When the water is about to turn greenish in colour, zooplankton are trawled for at the reservoirs and inoculated into the fertilized tanks. The zooplankton multiply and bloom within one week and are then collected daily to feed the fry. The tanks are subsequently fertilized weekly to sustain a steady population of zooplankton.

For the first one month of life, the hatchlings are usually fed intensively inside the indoor concrete tanks. Thereafter, the fry are transferred to the outdoor concrete tanks where they grow on the abundant zooplankton, and aquatic insects. Zooplankton feeding is also supplemented with a high protein artificial feed from the third week of life. Growth at the outdoor tanks is fast and at 2 months old, the fingerlings are ready for sale to fish farmers or for transfer to grow-out earthen ponds.

RESULTS AND DISCUSSION

Breeding exercise commences with the onset of rainy from May/June to September/October, but the grow-out fingerlings continue all the year round. Table 1 shows the average production values for a breeding season.

There is a high prospect for Clarias fry and fingerling production in the Kainji Lake Research Institute Fisheries Division Hatchery Complex. The production, survival and growth records are very attractive and compare favourably with Clarias fry production by other workers (Hogendoorn, 1983; Viveen et al, undated). Production could be maximized with additional and improved facilities. The hatchery complex has no filteration system and the few mortalities experienced among the hatchlings are being attributed to poor water quality and insufficient feeding. Percentage spawning and hatching success are also affected by water quality. The use of small aerators and diffusers are inadequate for a large scale production of this type and should be replaced with a central blowing system (blowers). Concrete grow-out and broodstock ponds are also needed since water seepage is a major problem in our earthen ponds. A design for the modification and expansion of the Hatchery Complex to take care of these problems are being proposed for external funding.

CONCLUSION

Production of Clarias fry and fingerlings in indoor and outdoor concrete tanks is a promising source of Clarias fingerlings in Nigeria. Although other advanced methods like the stripping technique can be adopted, induced breeding in concrete tanks does not involve complex technicalities and equipment and can therefore, be easily practised by fish farmers. The male stock are not usually depleted by sacrificing them for milt as in stripping technique. The production values are also very high and compares favourably with other breeding techniques. With the proposed modification and expansion project, production is being projected at over 0.5 million fingerlings per breeding season.

REFERENCES

ADIGUN, N.O.; ANTONY, A.D. and BARKER, J.C. (1983) Induced spawning of African catfish, Clarias lazera (C&V) using acetone dried carp pituitary extract, Deoxycorticosterone acetate (DOCA) and Human Chorionic Gonadotropin. Paper Presented at the 3rd Annual Conference of the Fisheries Society of Nigeria (FISON) at Maiduguri, 22nd-25th February, 1983.

De KIMPE, P. and MICHA, J.C. (1974) First guideline for the culture of C. lazera in Central Africa. Aquaculture 4: 227 - 248

Table 1 - Present production values for Clarias fry and fingerlings

1.	Species of Clarias commonly produced		(a) Clarias anguillaris (b) Clarias gariepinus
2.	Rate of induced breeding exercise:		Forthnightly (twice a month for 3-4 months June/July to September/October
3.	Average No. of breeders per breeding exercise	-	6 males and 3 females
4.	Percentage spawning success	-	66 to 100%
5.	Percentage Hatching success	-	75 to 85%
6.	Average No. of Hatchings per female breeder (above 700 g wt.)	-	Over 4,000
7.	Percentage survival after one month	-	70 to 80%
8.	Percentage survival after 2 months	-	70 to 75%
9.	Growth performace:-		

	Less than One day Old	One month Old (4 wks)	Two months Old (8 wks)
Average weight:	1 - 2 mg	0.8g (80mg)	6 - 10 g
Average total length	6 - 7 mm	28 mm	8 - 12 cm

HOGENDOORN, H. (1979) Controlled propagation of the African catfish, Clarias lazera (C & V). I: Reproductive biology and field experiments. Aquaculture 17: 323 - 333

HOGENDOORN, H. (1983) The African catfish (Clarias lazera (C & V, 1840) - A new species for aquaculture. Dissertation. Agriculture University, Wageningen. The Netherlands.

HUISMAN, E.A.; SKJERVOLD, H. and RICHTER, C.J. (1976) Aspects of fish culture and fish breeding. Miscellaneous paper 13 (1976). Landbouwhoge School - Wageningen, The Netherlands.

MADU, C.T.; OKOYE, F.C.; SADO, E.K.; OTUBUSIN, S.O. and ITA, E.O. (1984) Induced spawning of Clarias anguillaris Annual Report, Kainji Lake Research Institute, New Bussa.

MILLS, H.D. (1966) The African mudfish, Clarias lazera. Ibadan University Press, Ibadan. p 42

REED, W; BURCHARD, J.; HOPSON, A.J.; JENNESS, J. and YARO, I. (1967) Fish and Fisheries of Northern Nigeria. Ministry of Agriculture, Northern Nigeria. 78-79, 226

VIVEEN, W.J.A.R.; RICHTER, C.J.J; Van OORDT, P.G.W.J; JANSSEN, J.A.L. and HUISMAN, E.A. (undated). Practical Manual for the Culture of the African Catfish (Clarias gariepinus). Section for Research and Technology, Netherlands. Minister for Development Cooperation, P.O. Box 20061, 2500 E.B. The HAGUE, The Netherlands.