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Review

The culture of Catfish in Nigeria: Progress, prospects and problems

Chika I. K and Nathaniel Oboroh

African Regional Aquaculture Centre/Nigerian Institute for Oceanography and Marine Research, P.M.B 5122, Port-Harcourt, Nigeria.

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A review of the culture of catfish of the family Claridae in Nigeria was carried out using secondary data. The story of aquaculture in Nigeria is essentially the story of catfish culture. The favoured catfish species include: *Clarias gariepinus*, *Heterobranchus bidorsalis*, *Clarias* × *Heterobranchus* hybrid ('Heteroclarias') and *Clarias nigrodigitatus*. *C. gariepinus* and Heterobranchus are the most farmed fish in Nigeria. Catfish farming has continued to attract private sector initiative compared to earlier public or government-sponsored programmes. If the associated problems of production, especially the twin issue of feed production and fingerling supply are tackled, Nigeria will soon become a world exporter of catfish.

Key words: Nigeria, culture, catfish, *Clarias*, *Heterobranchus*.

INTRODUCTION

The story of aquaculture in Nigeria is essentially the story of catfish culture and the hope of fish supply in Nigeria hang on its development and culture. Recent trends all over the world, point to a decline in landing from capture fisheries, an indicator that fish stocks have approached or even exceeded the point of maximum sustainable yield. Aquaculture therefore remains the only viable alternative for increasing fish production in order to meet the protein need of the people.

Catfishes of the family Claridae comprise the most commonly cultivated fishes in Nigeria. The growth of aquaculture in Nigeria now is largely being boosted by a steady rise in catfish culture. Inadequate availability of seed for stocking and feed used to be major problems. Tremendous progress is now being made. The total value of the industry today is US$800 from the value of fingerlings, feed and farmed fish. Since the culture of *Clarias gariepinus* through hypophysation was initiated in Western Nigeria in 1973, the procedure has been widely practiced throughout Nigeria thus leading to increase of farm-raised catfishes from the 80's to date. The favoured catfish species in Nigeria aquaculture include: *C. gariepinus, Heterobranchus bidorsalis*, *Clarias* × *Heterobranchus* hybrid (Heteroclarias) and *Clarias nigrodigitatus*. *Heterobranchus* sp. is the more commonly cultured fish in the south eastern parts of Nigeria. African catfish is popular in the market and has great potentials to boost the rapidly growing Nigerian aquaculture.

*Corresponding author. E-mail: Ikchuks@yaho.com

LARVAL PRODUCTION

In Nigeria, the minimum fish fingerling requirement is 4.3 billion while the total fingerling supply from all sources is 55.8 million (FDF, 2007). These are not enough to meet the fish farmers' demands. However, the sector is progressing. In Europe, about 75% of *Clarias* fingerling demands are supplied by a few producers. Seventy five percent **(**75%) of the estimated 140,000 tonnes of catfish production is from tanks with hundreds of small-scale hatcheries producing high-quality seed and four local feed mills producing high-quality floating pellets as well as 12 brands of imported pelleted feed.

Artificial propagation of *C. gariepinus* is now carried out in hatcheries with hormonal induction. Farmers have found the homoplastic pituitary gland suspension cheaper, practical and more highly reliable than the

Table 1. Some plant residues used for Clariidae culture in Nigeria.

Conventional plant feedstuffs	Availability	Fish species	References
Groundnut cake	Adequate	*Clarias. anguillaris*	Solomon et al. (1996); Eyo and Adebayo (1990)
Soybean cake, full fat/defatted, dehulled solvent extracted, soybean flour; extruded/non extruded	Adequate	*C. anguillaris* *C. gariepinus* *C. gariepinus* *H. longifilis*	Solomon et al. (1996), Balogun and Ologhobo (1989), Fashakin and Balogun (1996), Adewumi (2005) Eyo et al. (2001), Fagbenro and Davis (2003)
Non-conventional plant feedstuffs	**Availability**	**Fish species**	**References**
Cocoa pod husk	Adequate	*Clarias isheriensiss*	Fagbenro (1992)
Sesame seed	N/A	*C. gariepinus*	Olukunle and Falaye (1998)

Oresegun et al. (2007).

imported synthetic hormonal analogues. The *C. gariepinus* broodstock weight used for artificial breeding ranges between 0.3 and 2 kg (Olaleye, 2005). Despite the breakthrough with use of hormone in induced spawning; fry survival is still beset with a number of biotic and abiotic factors. The biotic factors include cannibalism, heavy predation by frogs/aquatic insects and the abiotic factors include water temperature, dissolved oxygen *(*>4.5 mg/L*),* levels of ammonia. In Southern Nigeria, the prevalent water temperature of about 24 to 27°C could aid hatching and fry survival but in the arid parts of Nigeria, too high temperature is inimical to fry survival. During the first week after stocking, the most critical factor for the successful nursing of the catfish larvae is the availability of zooplankton. Feeds and feeding of the larvae, fry and fingerlings of the catfishes have been most studied and shown to influence the growth and survival of the fish (Egborge and Chigbu, 1988; Ovie, 1996; Osuji et al., 2003). Studies have revealed that live zooplankton is the preferred larval food. Many smallholdings merely rear larvae to fingerling size in organically fertilized ponds at a density of between 30 and 1000 larvae/m^2 (Olaleye, 2005). Fingerlings are stocked into rearing ponds at a rate of 50 to 75 fish/m^3 under good management.

THE CULTURE SYSTEM

Because of the cannibalistic nature of *C. gariepinus,* multiple sorting is essential. As the fish grow, big ones of the same size-group are removed to another tank for rearing. Thus harvesting is done at different periods for the different groups sorted**.** For outdoor fry/fingerlings rearing, screening of the tanks with mosquito nets is recommended to prevent dragonfly and other predatory insects from breeding in the ponds. Poly-culture of *C. gariepinus* and Tilapia species is practiced. A poly-culture of *C. gariepinus* and O*reochromis niloticus,* integrated with poultry with some supplementary feeding had been shown to be viable.

FEED AND FEEDING

Feed and feeding of catfishes in grow out ponds are perhaps the most documented in literature (Ayinla, 1988; Adewumi, 2005; Alegbeleye et al., 2008; Oresegun et al., 2007; Olukunle, 2009). Various efforts have been made to establish the crude protein and amino acid requirement of *C. gariepinus.* Ayinla (1988) recommended 35 and 40% crude protein (CP) for raising table size and brood stock respectively. Of the 10 essential amino acids (EAAs) required by warm water fish species, only three EAAs studied have been documented and these are arginine, methionine and lysine. In order to formulate and compound aqua feeds that will meet the nutrient requirements of the catfish at affordable cost, several conventional and non-conventional animal by-products and plant residues have been tested to substitute or replace fishmeal (Table 1). Feeding development has moved from the use of single ingredient, broadcasting un-pelleted meal to use of pelleted feeds. Fish may be fed sinking or floating pelleted feeds. The sinking pelleted feeds are fairly common and less costly to manufacture than the floating, or extruded, floating feeds. However, the use of pelleted floating feed has made a big difference to aquaculture development in Nigeria as *C. gariepinus* is being raised to maturity within 6 months. Better feeding conversion ratios (FCR) are obtained in general with floating feeds.

HYBRIDIZATION OF *C. gariepinus* × *H. longifilis*

The yearnings of farmers and scientists to have a farmed catfish that combines the fast growth traits of *Heterobranchus* spp and early maturing traits of *C. gariepinus* led to the development of a hybrid *'Heteroclarias'*. The technology was widely accepted as it

Figure 1. Concrete fish tanks in the fish-farming village (Miller and Atanda, 2007).

gave 58% internal rate of return (IRR) on investment (Adeogun et al., 1999).

FISH-FARMING VILLAGE

Miller and Atanda (2007) reported that in Ijebu-Ode, Nigeria, there is a "Fish-Farming Village" where catfish are raised in concrete block tanks owned by cooperative societies. There are about 175 cooperative fish farmers in this scheme now with some having several fish production units. This cooperative approach to fish farming has been successful for some five years now. The village consists of more than 200 concrete tanks of some 8 × 2 × 1.5 m each (16 m^3), typically built with concrete blocks of two or three contiguous walls (Figure 1). This idea for raising fish was originated by civil servants who wanted to raise fish but did not have the land, or time to devote to the activity.

PROSPECTS AND PROBLEMS OF CULTURE

It was observed that of over 30,000 MT of various freshwater and brackish water fish species caught in the year 2000, catfishes were more abundant next to tilapias (Table 2). FDF (2007) record revealed that the 46,206 MT of catfishes were produced in the year 2007. These were consumed locally. With the present population of 140 million, a projected increase at an annual growth rate of 3.2% and the expected increase in fish demand (Table 3). There is still great need for higher production. This will reduce fish importation and make room for export earnings.

A number of problems confront the production of catfish. Prominent among these are: Poor management skills, inadequate supply of good quality seed, lack of capital, high cost of feed, faulty data collection, lack of environmental impact consideration and marketing of products. Many people who are currently engaged in catfish farming lack management skill.

Although there had been a lot of research work on the production of catfish feed and feeding and the use of cheap feedstuffs to replace or substitute fishmeal, catfish farmers still rely on the costly, mostly imported pelleted floating feed. The success of the industries for channel catfish, rainbow trout and the salmonids in the USA is due mainly to the availability of pelleted diets formulated based on the results obtained from the nutritional studies of fishes over many years. There is urgent need for co-ordination of such research work and the feed manufacturers' access to the relevant data for quality and relatively cheap feed production.

The federal/state governments' public/private partnership initiative programmes and the various private concerns establishing standard hatcheries are gradually

Table 2. Aquaculture production in Nigeria in year 2003.

Species	Tonnes
Tilapia, (*O. niloticus*), *O. niloticus* × O*reochromis Aureus* hybrid)	11,363
Sarotherodon galilaeus, Sarotherodon melanopleura, T. zilli, T. guinensis	3,025
Mud catfishes (*C. gariepinus, C. anguillaris, C .isheriensis*)	6,553
Heterobranchus bidorsalis, H. longifilis, *Heterobranchus* × *Clarias* hybrids	2,832
Brackish water catfish (*Chrysicthys nigrodigitatus*)	1,515
Carp (*Cyprinus carpio*); goldfish (*Carasius* sp.*)*	1,280
Heterotis (*Heterotis niloticus*)	654
Mullets (*Mugil cephalus*, *Liza falcipinnis*)	336
Snakehead (*Parachanna obscrura*)	297
Other fishes	2,921
Total	30,776

Source: Fagbenro et al. (2003).

Table 3. Projected population and fish demand 2010 to 2020.

Year	Population (million)	Fish demand (million tonnes)
2010	158.8	3.02
2011	163.9	3.11
2012	169.1	3.21
2013	174.5	3.32
2014	180.1	3.42
2015	185.9	3.53
2016	191.9	3.65
2017	198.0	3.76
2018	204.3	3.88
2019	210.9	4.01
2020	217.6	4.13
2021	224.6	4.27
2022	231.7	4.40
2023	239.2	4.54
2024	246.8	4.69
2025	254.7	4.84

Source: FDF, 2007.

yielding results to solve the problem of seed scarcity. However, to produce good quality seed, aquaculture needs to explore the potential of genetic engineering. As at today, most teaching institutions do not have well equipped genetic laboratories where research can be carried out on the production of genetically improved catfish species (Omitoyin, 2007).

CONCLUSION

Considerable effort had been devoted to the study and production of *Clarias* and *Heterobranchuis* spp. in Nigeria. Catfish farming had continued to attract private sector initiative compared to earlier public or government-sponsored programmes. If the associated problems of production, especially the twin issue of feed production and fingerling supply are tackled, Nigeria will soon become a world exporter of catfish. Should you not also discuss local and national consumption as Nigeria has a huge and rapidly expanding population?

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